PRICE $2.00

HEATHKIT
ASSEMBLY MANUAL

HEATHKIT by DAYSTROM

"SHAWNEE" 6-METER TRANSCEIVER

MODEL HW-10

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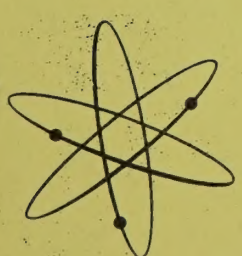


"SHAWNEE" 6-METER TRANSCEIVER

MODEL HW-10

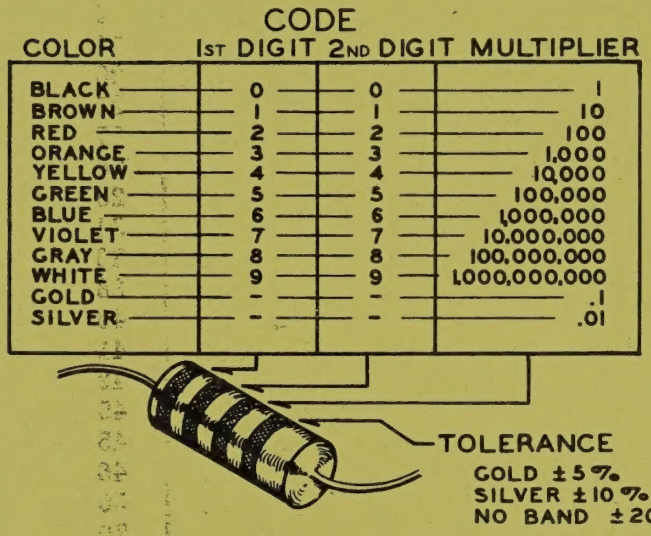
RESISTOR AND CAPACITOR COLOR CODES

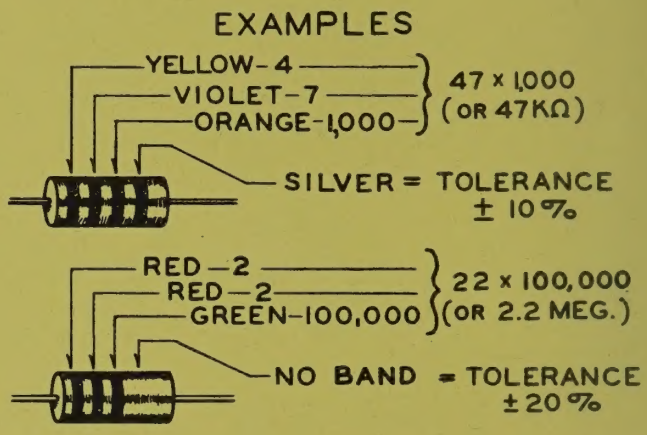
RESISTORS

The colored bands around the body of a color coded resistor represent its value in ohms. These colored bands are grouped toward one end of the resistor body. Starting with this end of the resistor, the first band represents the first digit of the resistance value; the second band represents the second digit; the third band represents the number by which the first two digits are multiplied. A fourth band of gold or silver represents a tolerance of ±5% or ±10% respectively. The absence of a fourth band indicates a tolerance of ±20%.

The physical size of a composition resistor is related to its wattage rating. Size increases progressively as the wattage rating is increased. The diameters of 1/2 watt, 1 watt and 2 watt resistors are approximately 1/8", 1/4" and 5/16", respectively.

The color code chart and examples which follow provide the information required to identify color coded resistors.

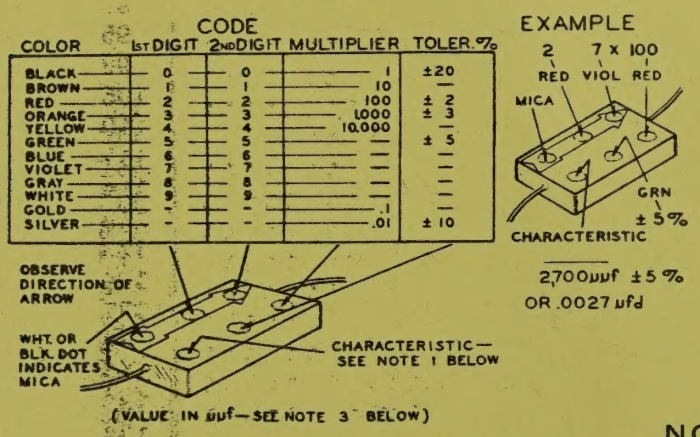




CAPACITORS

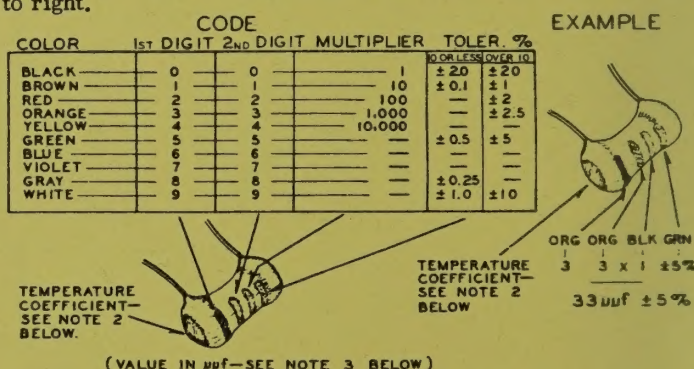
Generally, only mica and tubular ceramic capacitors, used in modern equipment, are color coded. The color codes differ somewhat among capacitor manufacturers, however the codes shown below apply to practically all of the mica and tubular ceramic capacitors that are in common use. These codes comply with EIA (Electronics Industries Association) Standards.

MICA



TUBULAR CERAMIC

Place the group of rings or dots to the left and read from left to right.



NOTES:

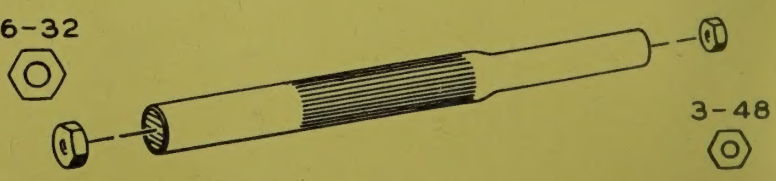
1. The characteristic of a mica capacitor is the temperature coefficient, drift capacitance and insulation resistance. This information is not usually needed to identify a capacitor but, if desired, it can be obtained by referring to EIA Standard, RS-153 (a Standard of Electronic Industries Association.)

2. The temperature coefficient of a capacitor is the predictable change in capacitance with temperature change and is expressed in parts per million per degree centigrade. Refer to EIA Standard, RS-198 (a Standard of Electronic Industries Association.)

3. The farad is the basic unit of capacitance, however capacitor values are generally expressed in terms of μfd (microfarad, .000001 farad) and μμf (micro-micro-farad, .000001 μfd); therefore, 1,000 μμf = .001 μfd, 1,000,000 μμf = 1μfd.

USING A PLASTIC NUT STARTER

A plastic nut starter offers a convenient method of starting the most used sizes: 3/16" and 1/4" (3-48 and 6-32). When the correct end is pushed down over a nut, the pliable tool conforms to the shape of the nut and the nut is gently held while it is being picked up and started on the screw. The tool should only be used to start the nut.



Assembly and Operation of the

HEATHKIT® by Daystrom

"SHAWNEE" 6-METER TRANSCEIVER

MODEL HW-10

HEATH COMPANY,
BENTON HARBOR,
MICHIGAN

a subsidiary of
DAYSTROM, INCORPORATED

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TABLE OF CONTENTS

Specifications	2
Introduction	3
Circuit Description	4
Construction Notes	19
Parts List	20
Proper Soldering Techniques	25
Step-By-Step Procedure	27
Step-By-Step Assembly	28
Parts Mounting On Main Chassis	28
Assembly Of The Partition Plates	34
Power Supply Section	36
Power Connector Plug Wiring	38
Wiring Of The Modulator Section	40
Cable Assembly Installation	41
Relay Contact Wiring	42
Notes On Receiver Section	45
Receiver Subchassis	45
Receiver Subchassis Wiring	46
Shaft Support Bracket Assembly	50
VFO Assembly	70
Front Panel Assembly	81
Front Panel Wiring	84
Meter Circuit Wiring	90
Receiver Dial Cord Stringing	90
Wiring Of AC Power Connector And Plug	94
Preliminary Operation Checks	95
Receiver Alignment	98
Transmitter Alignment	105
Final Assembly	110
Installation In Cabinet	112
Mobile Power Cable Wiring	114
Operation	119
Troubleshooting Chart	123
Types Of Antennas	124
In Case Of Difficulty	127
Equipment List	132
Frequency Chart	133
Bibliography	133
Spurious Signals	134
Service Information	135
Service	135
Replacements	136
Shipping Instructions	136
Warranty	137
Voltage Chart	138
Resistance Chart	139
Schematic	139 *

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SPECIFICATIONS

RECEIVER SECTION

Frequency Coverage	49.8 to 54.0 mc.
IF Frequencies	Double Conversion - First IF - 22 to 26 mc (tunable). Second IF - 2 mc.
Noise Figure	6 db or less.
Sensitivity	.5 microvolts of input signal will provide an output signal better than 10 db over the noise level.
Squelch Sensitivity	Less than 1 microvolt.
Selectivity	15 kc at 6 db down.
Image Rejection	Better than 70 db.
IF Rejection	50 db.
Input Impedance	50 to 72 Ω, unbalanced.
Audio Power Output	3 watts (receiver operation). 15 watts (public address operation).
Headphone Jack	Low Impedance - Accepts PL-55 type plug (standard 2-conductor 1/4" sleeve).
External Speaker Socket	8 Ω Impedance - Accepts RCA type phono plug.

TRANSMITTER SECTION

Frequency Coverage	49.8 to 54.0 mc (Crystal or VFO control).
Modulation	.01 volt minimum at 1000 cps = 100%.
RF Power Output	8 watts nominal AM 10 watts nominal CW } 50 Ω nonreactive load
Distortion	10% or less, with 100% modulation at 1000 cps.
Output Impedance	50 to 72 Ω, unbalanced.
Low Pass Filter	54 mc cutoff frequency.
Key Jack	Accepts PL-55 type plug (standard 2-conductor 1/4" sleeve).
Crystal Sockets	Accepts FT-243 type holders. Pin diameter - .093" Pin spacing - .486".
Microphone	High impedance ceramic element push-to-talk type with coil cord and mounting clip.
Crystals (not furnished)	8 mc fundamental range. (8.333 to 9.000 mc. for 6-meter band).

GENERAL

Power Requirements	Input voltage: 6.3 V DC 12.6 V DC 117 V AC Transmit - 14.5 amps 7.5 amps 120 watts Receive - 8.5 amps 4.5 amps 60 watts
Cabinet Dimensions	6" high x 10" deep x 12" wide.
Weight	Net - 30 lbs. Shipping - 34 lbs.

INTRODUCTION

The HEATHKIT Model HW-10 "Shawnee" is a complete AM and CW 6-meter station, designed for both mobile and fixed station use. It combines in a single compact unit all the functions of both a receiver and transmitter. A built-in, three-way power supply is used for 117 volts AC and either 6 or 12 volt DC operation, any one of which may be selected by changing power plugs. A universal bracket arrangement allows mounting the unit under the instrument panel or on the transmission hump of an automobile; yet by loosening two knurled thumbnuts, the "Shawnee" is easily removed for portable or fixed station use.

The superheterodyne receiver uses double conversion. Maximum frequency stability is achieved by the use of a crystal controlled VHF conversion oscillator and a highly stable low-frequency tunable oscillator. The RF section employs a cascode-type RF amplifier, resulting in a noise figure better than 6 decibels. A relative signal strength meter is incorporated in the receiver which automatically indicates relative power output plus modulation level when the unit is switched from RECEIVE to TRANSMIT. Also featured is an RF GAIN control, BFO (beat frequency oscillator), ANL (automatic noise limiter), SQUELCH, and AVC ON-OFF switch.

The transmitter section features a built-in VFO (with all frequency determining components mounted on a "heat-sink" plate) plus adjustable temperature compensation for various operating habits. Four switch-selected crystal positions are provided for MARS, or net operation. The driver and all frequency multiplying stages are mechanically tracked with the VFO, providing single-knob tuning of all exciter stages for complete ease of mobile operation. To shift frequnecy with the "Shawnee" it is only necessary to tune the XMTR TUNING control to the desired frequency and, if the frequency excursion is 500 kc or more, peak the FINAL TUNING control for maximum output. A 6360 dual tetrode operates push-pull in the final RF amplifier and, with tunable-link output coupling for 50 or 72 Ω transmission line, provides 8 to 10 watts of RF carrier power output to the antenna. Incorporated in the RF output line is a built-in low-pass filter to reduce harmonics and any spurious energy which might otherwise reach the antenna.

The combination audio amplifier-modulator delivers better than 10 watts of audio for high-level plate modulation of the RF final amplifier, and up to 3 watts of audio for the internal speaker when the unit is receiving. Fifteen watts for public-address operation is also available, using an external speaker, by means of a push-pull switch on the MOD. LEVEL control.

Dependable DC power supply operation is provided by a heavy-duty, full-wave split-reed, 8-contact, interrupter-type vibrator and four silicon type rectifiers. The rectifiers are used in a bridge circuit when transmitting and in a full-wave circuit when receiving. A primary-fused relay and heavy-duty power cables are provided for the utmost in protection and efficient power supply operation in mobile installations. The power supply, final RF amplifier, and receiver front end sections are completely shielded, using feed-through type capacitors for all leads entering these compartments. This assures maximum stability and maximum practicable freedom from noise when operating.

Other features included are a VFO SPOT switch for zeroing on received signals with the transmitter off, and a modulation monitor circuit using the headphone jack. A push-to-talk control system is employed for rapid break-in operation.

The slide-rule type dial and the meter are edge illuminated. The dial, along with vernier tuning, provides seven inches of bandspread for both receiver and VFO tuning.

Fifteen tubes, including a voltage regulator for all oscillators, are employed in the "Shawnee." The total primary power consumption is approximately 120 watts.

We suggest that the builder study the following Block Diagram and thoroughly read the Circuit Description before starting construction. This knowledge is an invaluable aid to construction and, as such, will give the builder a better understanding of the unit.

CIRCUIT DESCRIPTION

The "Shawnee" Transmitter-Receiver combination is a complex unit. Consequently, the schematic wiring diagrams are broken down into several sections (Figures 2 through 22) to aid in describing the circuit. A complete schematic of the unit is also supplied with this instruction manual as a "fold-out" (Page 139). Reference to the complete schematic, plus the following partial schematics, along with the block diagram, will help the reader to better understand the following information.

RECEIVER SECTION

The receiver portion of the unit employs ten tubes in a double-conversion, superheterodyne circuit. The audio driver and amplifier are also used as a driver and modulator when the transmitter section is energized for AM operation. The circuit consists of: A broad-band RF amplifier consisting of two triode stages; a low-noise pentode mixer with a crystal controlled oscillator for frequency conversion; a high-frequency tunable IF stage, tracked with a stable low-frequency tunable oscillator; and two low-frequency IF stages. RF GAIN, AVC, ANL, SQUELCH, and relative signal strength metering circuits are also incorporated in the receiver design.

The RF amplifier employs a 6BS8 dual triode in a cascode circuit configuration; this is a combination of a grounded cathode stage followed by a grounded grid stage. This particular circuit arrangement offers improved noise characteristics and high amplification. It is easily adjusted, stable, and well adapted to broad-band application. The stage is neutralized by L_n (see Figure 2) for optimum signal-to-noise ratio. An over-coupled, double-tuned circuit consisting of L-3, C8 and L-4 is used in the cascode output circuit to achieve

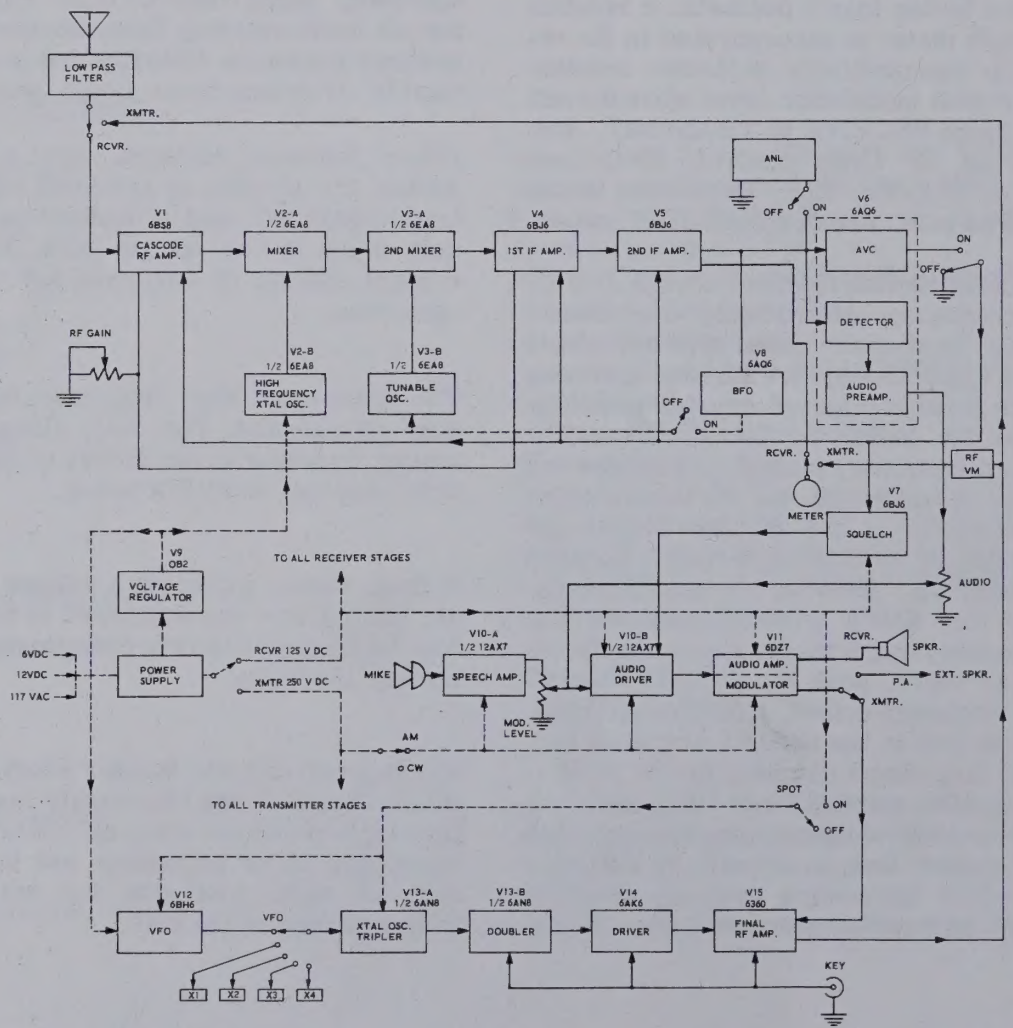


Figure 1

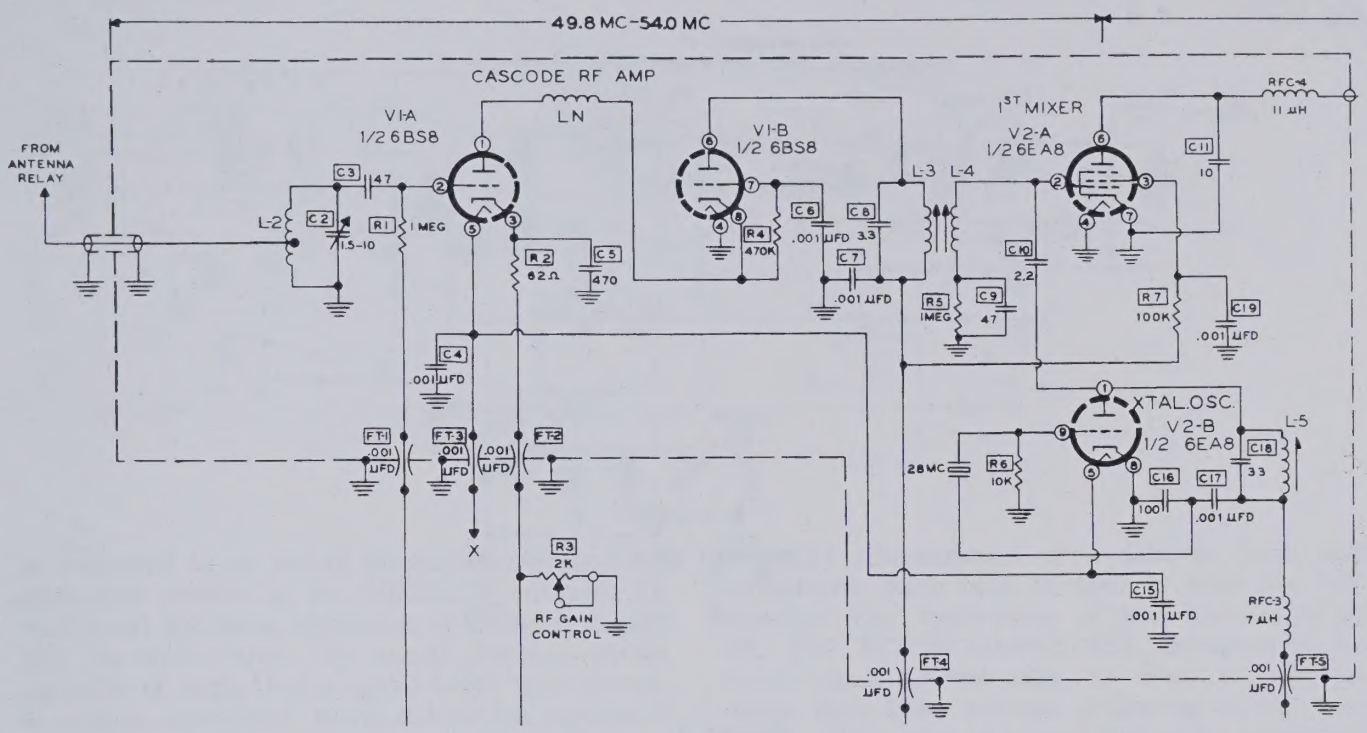


Figure 2

the desired band-pass characteristics over the 6-meter range. This circuit presents a high impedance at the signal frequency, but looks like a short circuit to signals in both IF ranges that may be picked up by the antenna. Coupling to the first mixer is by transformer action.

Control R3 in the cathode of the first section of the cascode circuit controls the sensitivity of the RF amplifier and is brought out to the front panel as the RF GAIN control. AVC is also applied to this stage.

The pentode section of a 6EA8 tube is used as a low-noise mixer with both the RF signal and oscillator voltage injected on the grid. Since the amplitude of the oscillator injection voltage affects conversion transconductance of a mixer, grid leak bias resistor, R5, is used so that optimum injection voltage is not critical. To prevent any tendency of the mixer to oscillate at or near the signal frequency, capacitor C11 is connected from plate to cathode directly at the socket. An RF choke, RFC-4, is connected in series with the mixer plate circuit to offer a high impedance to any spurious signals higher than the IF that might reach the IF circuits and appear as "birdies" across the tuning range of the receiver.

The crystal oscillator uses the triode section of the 6EA8 tube in a triode regenerative overtone circuit. A 28 mc, third overtone crystal is connected between the grid of the oscillator and capacitive feedback network (C16 and C17) which sustains overtone oscillation. Plate coil L-5 of the oscillator is tuned to this frequency and the oscillator signal is coupled for injection to the mixer by capacitor C10. The plate voltage is regulated for maximum stability of the oscillator.

The RF "front-end" circuits are mounted on a silver plated subchassis to provide low-impedance RF paths. This section is completely enclosed by shielding. All leads entering the section are decoupled by means of feed-through capacitors FT-1, FT-2, FT-3, FT-4, and FT-5; by RF choke RFC-3; and by resistors R1 and R2.

A three-section, ganged variable capacitor, C12-A, B, and C, simultaneously tunes the first mixer plate circuit, the second mixer grid circuit, and the low-frequency tunable oscillator stage. See Figure 3. Padding capacitors C13, C20, and C23 are used for good tracking across the tuning range of the high frequency IF. The tunable intermediate frequency stage IF-1 covers the range of 22 to 26 mc with the tunable

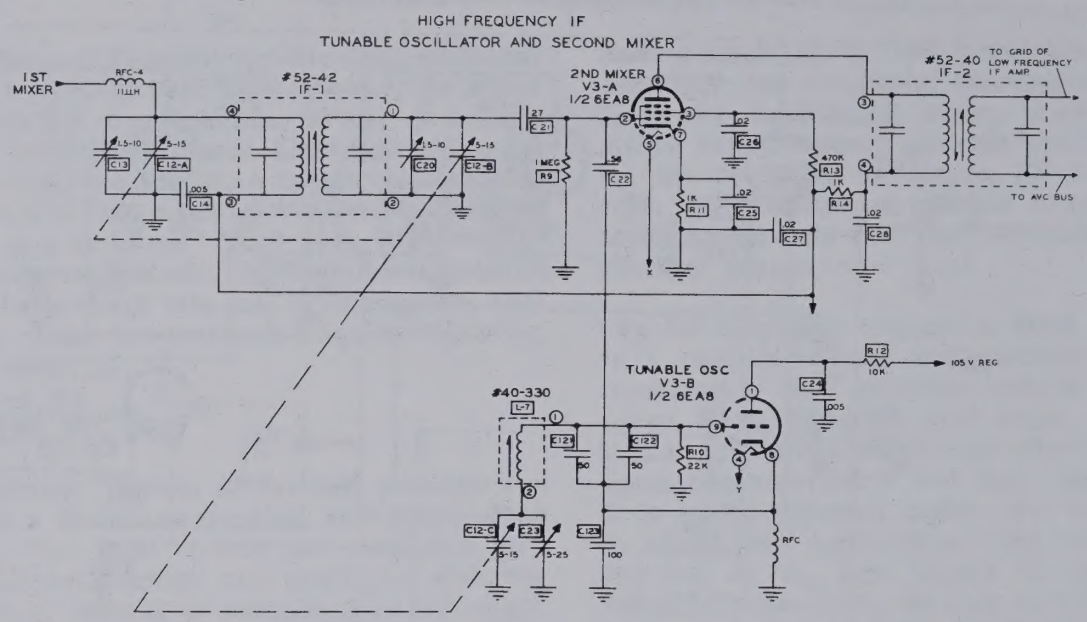


Figure 3

oscillator stage operating on the "low side." This results in a 2 mc difference signal at the plate of the second mixer. The second mixer also employs a 6EA8 type tube, and uses the pentode section for conversion to build up the signal strength of the high frequency IF.

The tunable oscillator stage operates 2 mc lower than the variable intermediate frequency. It covers the range of 20-24 mc with the triode section of the second 6EA8 tube employed in a Clapp oscillator circuit. Temperature compensating capacitor C122 and regulated B+ on the plate of the oscillator provides good stability from this circuit. Oscillator voltage injection to the grid of the mixer is supplied by coupling capacitor C22. A more thorough description of the Clapp oscillator circuit is given in the VFO circuit description on Page 11.

Maximum receiver gain and selectivity are achieved in the low-frequency IF stages, which operate at a center frequency of 2 mc. Two 6BJ6 remote cutoff tubes are used as IF amplifiers. Six tuned circuits, transformers IF-2, IF-3, and IF-4, are used to narrow the "skirt" response of the IF strip. See Figure 4.

The RF GAIN control, R3, is also connected in the cathode circuit of the first IF amplifier to control the gain of this stage. The relative signal strength meter is connected to the B+ feed for the plate and screen circuit of the second IF amplifier. (Also see Meter Circuit on Page 18.) These two IF amplifiers provide an abundance of gain for proper operation of the AVC and audio squelch circuits.

One of the diode sections of a 6AQ6 tube (pin 6 of V6) is employed for detection and AVC voltage. The diode load, R21 and R22, along with RF bypass capacitors C34 and C36 has been divided to provide a more effective filter to prevent the appearance of any RF voltage in the output of the detector. The detected audio voltage is filtered by R23 and C37 for the AVC BUS, and is applied to the RF stage and the two low-frequency IF stages for smooth AVC action on strong signals. The AVC BUS, which also feeds the squelch tube, can be disabled by grounding the circuit through the AVC switch.

A diode limiter of the silicon type, SD-1, is connected across the detector load and will handle any excessive noise pulses. This limiter

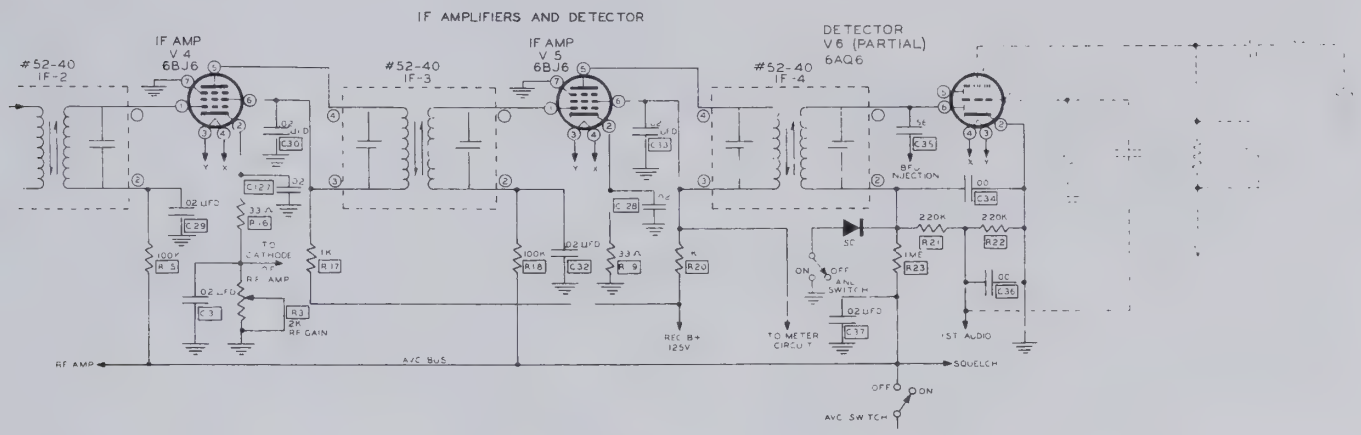


Figure 4

is switched in or out of the circuit by the ANL push-pull switch on the SQUELCH control. As with most limiters, distortion of the audio signal will increase when the signal input to these circuits is high. But a signal level high enough to cause excessive audio distortion normally will override the interfering noise to the extent that the limiter will not be needed. This limiter is very effective for weak signal reception when high impulse noise is encountered. The limiter also acts as a compressor and maintains the signal output nearly constant. This feature is useful for extreme fading conditions, monitoring of varous stations with different signal levels, and net operation.

The beat frequency oscillator uses the triode section of a 6AQ6 tube in a Hartley circuit tuned to 2 mc. See Figure 5. The variable capacity phenomenon of a silicon diode with adjustable back bias is used to tune the BFO through the band-pass of the low-frequency IF. The PITCH control, R32, mounted on the front panel of the unit, is used to vary the diode back bias voltage. Filtering of the back bias voltage line is accomplished by decoupling resistor R24 and filter capacitor C40. A voltage divider network consisting of R31, R32, and R33 develops the proper amount of back bias voltage across R32 to be applied to the silicon diode. The output of the BFO is coupled from the plate of the oscillator and injected to the plate of the diode detector through capacitor C35. A push-pull switch on the PITCH control turns the BFO ON or OFF. Stability of the oscillator is assured by regulated B+. (NOTE: The diode plates of the BFO tube V8 are not used.)

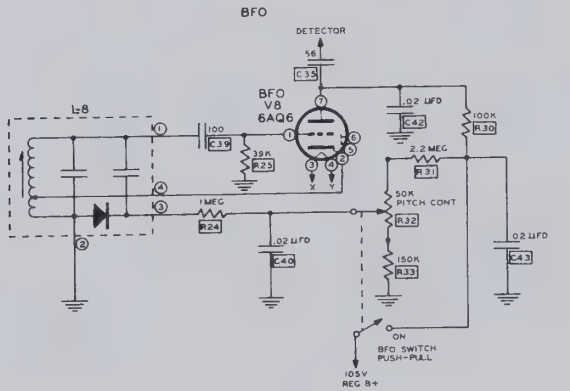


Figure 5

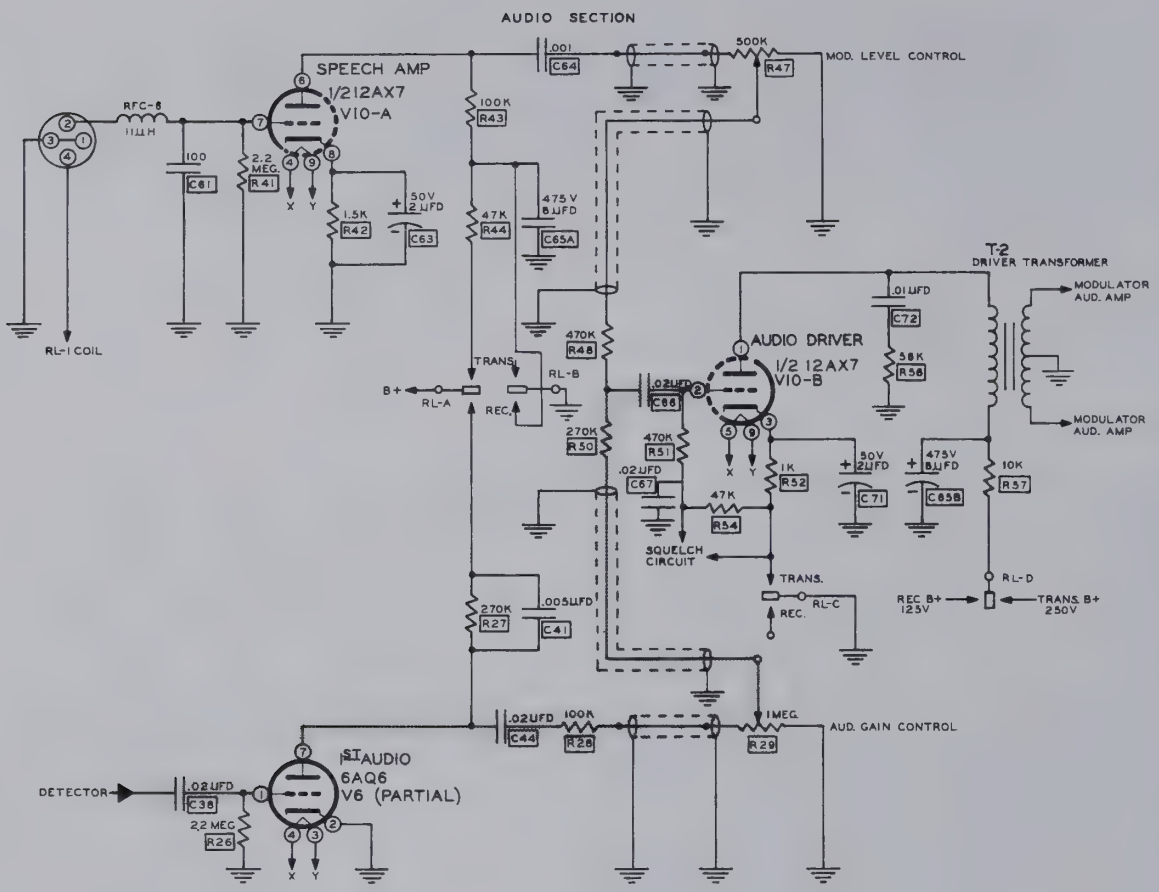


Figure 6

AUDIO/MODULATOR SECTION

Audio stages V6, V10-B, and V11 deliver sufficient audio power to fully drive a loudspeaker well over the motor and wind noises of an automobile in motion. The shaded areas on Figure 6 show the path of the audio signal from the receiver up to audio driver V10-B. The triode section of 6AQ6, V6, serves as the first audio amplifier of the receiver in a conventional resistance coupled circuit. Any IF signal that may have been coupled over to the plate circuit of the audio amplifier and appear as hiss in the output is bypassed by C41. AUDIO gain control, R29, located on the front panel, controls the amount of audio signal fed to the audio driver.

One section of a 12AX7 dual triode serves as a resistance coupled speech amplifier, V10-A, and the other section as an audio driver, V10-B. The audio driver is transformer coupled to the push-pull modulator-audio amplifier stage by driver transformer T-2. An RC dividing network, consisting of R48, R50, and C66, isolates the speech amplifier output circuit from the first audio stage of the receiver. No switching of the audio signal lines is required when changing from transmit to receive.

The input circuit of the speech amplifier is designed to be used with a high-impedance microphone and includes an RF choke, RFC-6, in series with the grid circuit to reject any RF energy that may be picked up on the micro-

phone. An RF bypass capacitor, C61, connected directly at the grid pin is also included in the circuit. The amount of signal fed to the driver from the speech amplifier is controlled by the MOD. LEVEL control, R47.

A low-value coupling capacitor, C64, in the speech amplifier output circuit, rejects the low frequencies and an RC series network, C72 and R56, in the plate circuit of the audio driver are used to cut off the high frequencies and to shape the audio response to favor the voice frequencies, thus allowing a higher average of audio level to be maintained where it will be the most effective for AM operation of the transmitter.

Supply voltages for the audio driver and audio amplifier-modulator are reduced for receiving operation to lower the drain on the power supply. The speech amplifier has its power removed during receive and filter capacitor C65-A in the plate circuit is placed at ground potential to avoid any feedback or hum pickup when not in use. The grid and cathode circuits of the audio driver stage are normally returned to the squelch circuit (see Figure 7), but are placed at ground potential when the unit is transmitting. The above switching changes are shown by relay contact sections RL-A, B, C, and D. These contacts are not shown completely accurate circuitwise, for the sake of clarity. (See relay and switching circuits, Figure 20.)

A 6BJ6 pentode functions as a squelch tube as shown in Figure 7. This circuit may be adjusted to render the audio section of the receiver inoperative until the AVC circuit is activated, giving complete quieting to receiver noise commonly associated with VHF reception. Squelch is useful in mobile or network operation where the no-signal receiver noise may cause undue operator fatigue. The squelch circuit can be disabled by turning the SQUELCH control, R55, full CCW (counterclockwise) or by placing the AVC switch to the OFF position, which opens the cathode circuit of the tube.

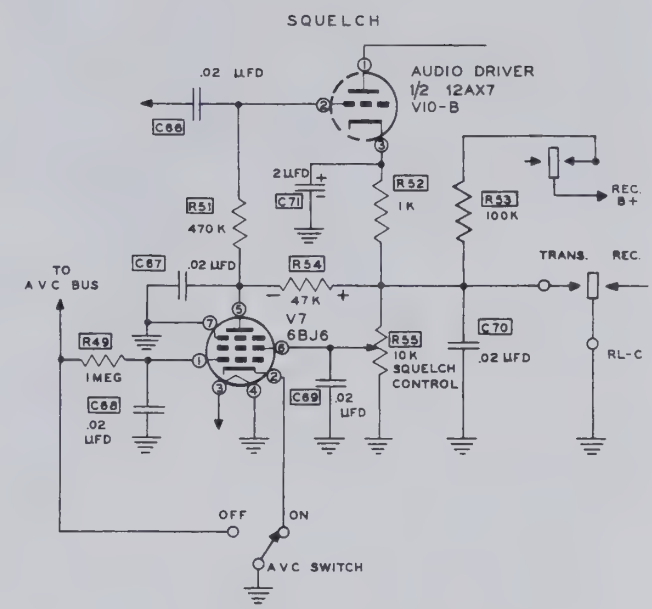


Figure 7

When the AVC voltage is low or zero, the 6BJ6 draws plate current developing a voltage drop across the plate load resistor, R54, of the polarity shown. This bias voltage is applied to the grid of the audio driver through R51, cutting the triode off, and no receiver noise is passed to the speaker. With an incoming signal, AVC voltage is developed and impressed on the grid of squelch tube, V7, cutting this tube off. With no plate current flow through R54, bias is removed from the audio driver, leaving only operating bias furnished by cathode resistor R52. The audio driver now functions as an ordinary amplifier and passes signals. Adjusting the SQUELCH control, R55, varies the screen voltage on the 6BJ6 which controls the cutoff bias. Thus, the SQUELCH control may be set for any noise or signal level.

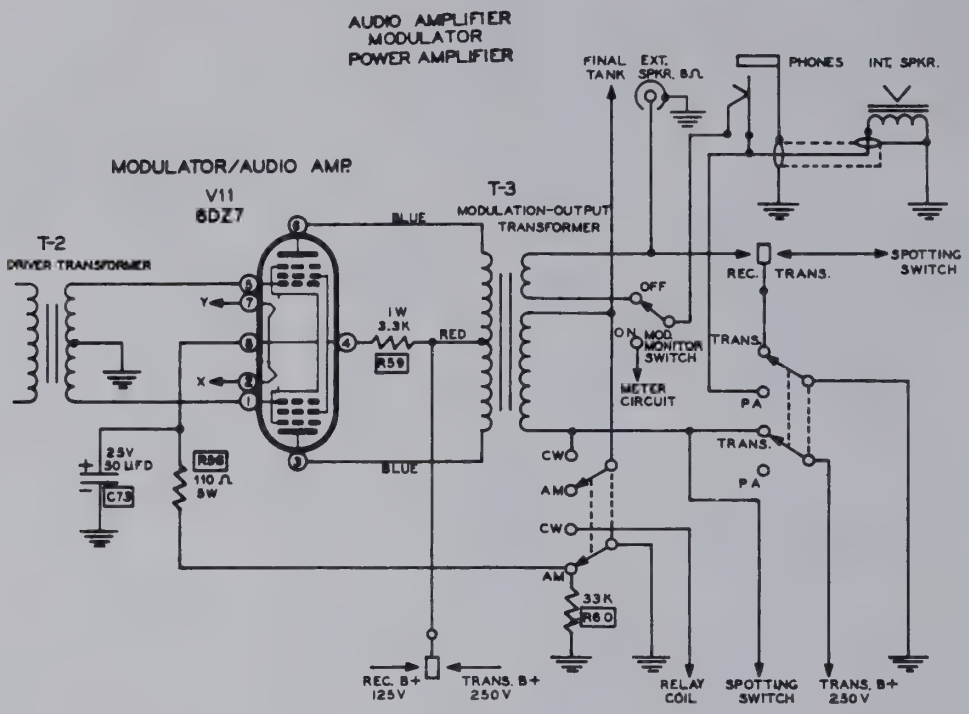


Figure 8

A 6DZ7 dual pentode operates class AB1 in push-pull, driving combination output - modulation transformer T-3 as shown in Figure 8. The secondary of the transformer has two windings; one winding matches the modulator to the RF amplifier plate circuit of the transmitter section and the other winding matches the tube, as an audio amplifier, to the speaker. The screen and plate voltages are reduced for receive operation. With higher voltages applied under transmit conditions, the modulator delivers about 10 watts of audio power to modulate the RF final amplifier.

When the transmitter is operated under CW conditions, the modulator is made inoperative by increasing its cathode resistance with R60, which is normally shorted out by a set of contacts on the AM-CW switch. This same set of contacts energizes the two changeover relays for CW operation. Another set of contacts on this same switch shorts out the modulation winding of transformer T-3, thus keeping the keyed RF final plate current from flowing through the winding.

The modulator may also be used as a public address amplifier by placing the push-pull switch on the MOD. LEVEL control to the PA position. A set of contacts on the switch opens the B+ circuit to the transmitter section. The other set of contacts disables the internal speaker and connects the low-impedance winding to the external speaker jack. Depressing the microphone button allows the full available B+ power from the power supply to be applied to the modulator for approximately 15 watts of audio output.

Plugging a set of head-phones into the PHONE jack disables the internal speaker, allowing the receiver to be monitored on the head phones only. Also, the modulated carrier from the transmitter can be checked with head-phones by placing the MOD. MONITOR switch to the ON position.

TRANSMITTER SECTION

Four tubes are used in the transmitter section. One of these tubes is used for VFO control of the transmitter, operating in the 8.333 to 9.000 mc range. Any one of four crystals in the same frequency range, or VFO operation is selectable by a five-position switch brought out to the front panel. Two multiplier stages and a driver stage are tracked together by using a 3-gang variable tuning capacitor mechanically geared to the VFO for single-knob tuning of all exciter stages. The VFO or crystal oscil-

lator stage may be turned on during receiving periods by placing the SPOT switch to the ON position, which applies plate voltage to these stages by way of the receiver circuits. This allows for "zero-beating" an incoming signal on the receiver or pretuning the exciter stages when crystal control is used.

The VFO circuit consists of a 6BH6 tube, V12, operating as a Clapp oscillator in the frequency range of 8.333 to 9.000 mc. All frequency determining components, C74 through C80 and L-9, are mounted on a heavy "heat-sink" plate for maximum stability. The oscillator is completely shielded, with the tube mounted inside the VFO housing. Mounting the tube inside the enclosure establishes a predetermined temperature for the frequency determining components, regardless of external environment usually encountered with mobile installations. A variable differential capacitor, C76, has a negative temperature compensating capacitor, C74, connected to one set of stator plates and a zero temperature coefficient capacitor, C75, connected to the other set of stator plates. This allows the operator to adjust the amount of temperature compensation needed for various environments. See Figure 9.

A double-bearing, ceramic-insulated tuning capacitor, C80, is used as the frequency control. A ceramic-insulated air trimmer, C79, is used for bandspread adjustment. The VFO frequency determining coil, L-9, is wound on a heavy ceramic slug-tuned form, heavily doped and baked. This combination achieves high-Q, low drift, and decreases the effect of humidity. Another negative temperature compensating capacitor, C78, is stud-mounted close to the coil. Thus, a rise in temperature of the coil will increase the inductance, and this same temperature rise will decrease the capacity of the temperature compensating capacitor. By properly proportioning these components, the effects of one cancel those of the other and the frequency remains essentially constant with reasonable changes in temperature.

The Clapp oscillator is a high-Q circuit obtained by tapping the tube across only a small portion of the oscillating tank circuit. This results in very loose coupling between the tube and circuit. Three capacitors connected in series across the coil (two large fixed value capacitors, C81 and C82, plus the total parallel capacity of C74 through C80) provide the taps across which the tube is connected. These large capacitances also lessen the effect of tube input capacitance on frequency. The 6BH6 tube operates essentially as an electron-coupled oscillator with the screen grid as the oscillator plate. The screen grid voltage is stabilized at 105 volts by an OB2 voltage regulator. With the screen grid operating as the oscillator plate, the actual tube plate is coupled to the oscillator only by the electron stream in the tube and is further shielded from the oscillator by the grounded suppressor grid. This effectively isolates the oscillator circuit from the following stages and lessens the effect of loading on VFO frequency.

The VFO output is tuned to the oscillator frequency by the plate coil, L-10. Coupling of the VFO output to the next stage is accomplished by coupling capacitor C86, which is connected to

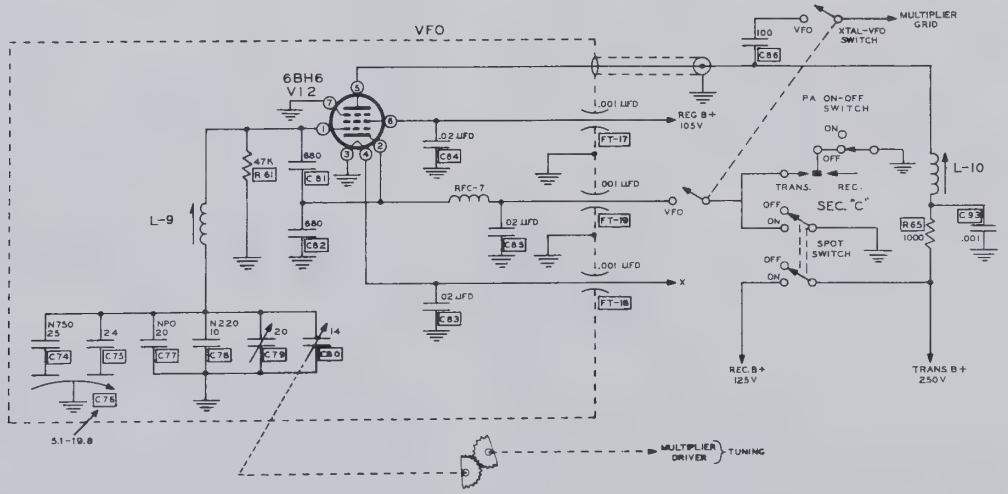


Figure 9

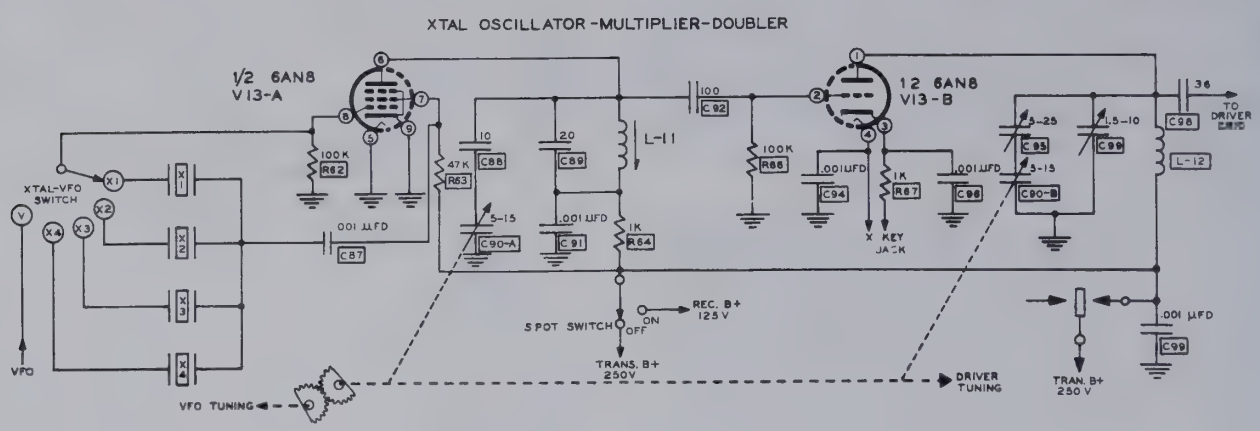


Figure 10

one position of the XTAL-VFO switch. With regulated B+ applied to the screen grid of the VFO during all modes of operation, the cathode circuit of this stage is opened to make it inoperative when using crystal control, when the modulator is used for public-address operation, or under receiving conditions. Placing the SPOT switch to the ON position completes the cathode circuit and applies receiver B+ to the plate of the 6BH6, energizing the stage.

The pentode section of a 6AN8 tube, V13-A, is operated in a Pierce crystal oscillator circuit with the crystals connected between the first grid and screen grid as shown in Figure 10. Any one of four crystals may be switched into the circuit by means of the XTAL-VFO switch. In the VFO position, the output of the VFO is connected between the grid and ground with sufficient bypassing of the screen provided by the distributed capacity of the crystal sockets and circuit wiring. The plate circuit is tuned to three times the input frequency by coil L-11 and one section of a 3-gang tuning capacitor C90-A. Capacitors C88 and C89 are incorporated for proper tracking of the circuit from 24.9 to 27.0 mc.

The triode section of the 6AN8, V13-B, operates as a doubler with coupling to the grid provided by capacitor C92. Self-bias is provided by cathode resistor R67 to protect the tube against loss of drive. The stage is keyed in the cathode circuit. Tuning of the plate circuit is accomplished by a second section of the 3-gang tuning capacitor, C90-B, with capacitors C95 and C99 tracking this stage from 49.8 to 54.0 mc.

Referring to Figure 11, a 6AK6 tube, V14, is used as the buffer driver stage, providing sufficient drive to the final. It incorporates a series-tuned plate tank circuit with the tank coil, L-13, providing a balanced output. The third section of the 3-gang tuning capacitor, C90-C, tunes this stage from 49.8 to 54.0 mc. Capacitors C104 and C105 provide proper tracking. Balanced RF coupling to the final RF amplifier grids is accomplished by coupling capacitors C106 and C107. RF isolation of the grid leads is provided by grid resistors R70 and R71. This stage is also keyed in the cathode circuit.

The balanced output circuit of the driver stage is capacitively coupled to a push-pull, miniature, beam, dual-tetrode stage employing a 6360 tube, V15. See Figure 12. The tube functions as a Class C amplifier with the bias and screen voltages set to optimum operating values. The stage operates "straight-through" with the plate circuit, L-14 and C112, tuned to 6-meters in a balanced output configuration. The RF output circuit is inductively coupled by means of an adjustable "link" coil, L-15, to the low-pass filter through the antenna relay contacts of RL-2.

Variable capacitor, C113, connected between the link coil and ground, tunes out any reactance that may be present in the coupling link.

A small germanium diode, GD-2, is used to rectify a minute portion of the output voltage supplied by capacitor C114. This rectified voltage is indicated on the front panel meter. Transmitter adjustment is greatly simplified by the use of this RF voltmeter, which indicates proper tuning by a maximum reading.

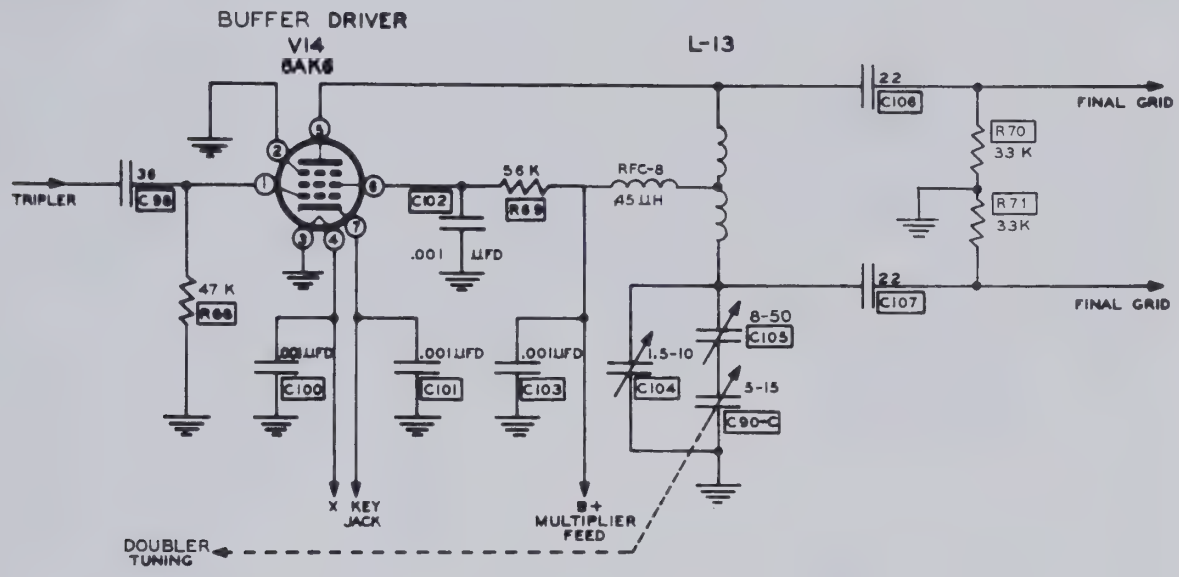


Figure 11

The final amplifier screen grid is modulated along with the plate by the plate return, which is routed through the secondary winding of modulation transformer T-3 for AM operation. See Figure 8 on Page 10. The 6360 tube is protected from loss of drive by self-bias provided by cathode resistor R72, and is keyed in the cathode circuit for CW operation of the transmitter. Power input to the stage is close to 18 watts, permitting a carrier power output of 8 to 10 watts.

All RF circuitry of the final amplifier is completely enclosed by shielding to reduce radiation loss and to provide stable operation of the final. All leads entering the enclosure are bypassed by feed-through capacitors FT-14, FT-15, FT-16, and FT-20.

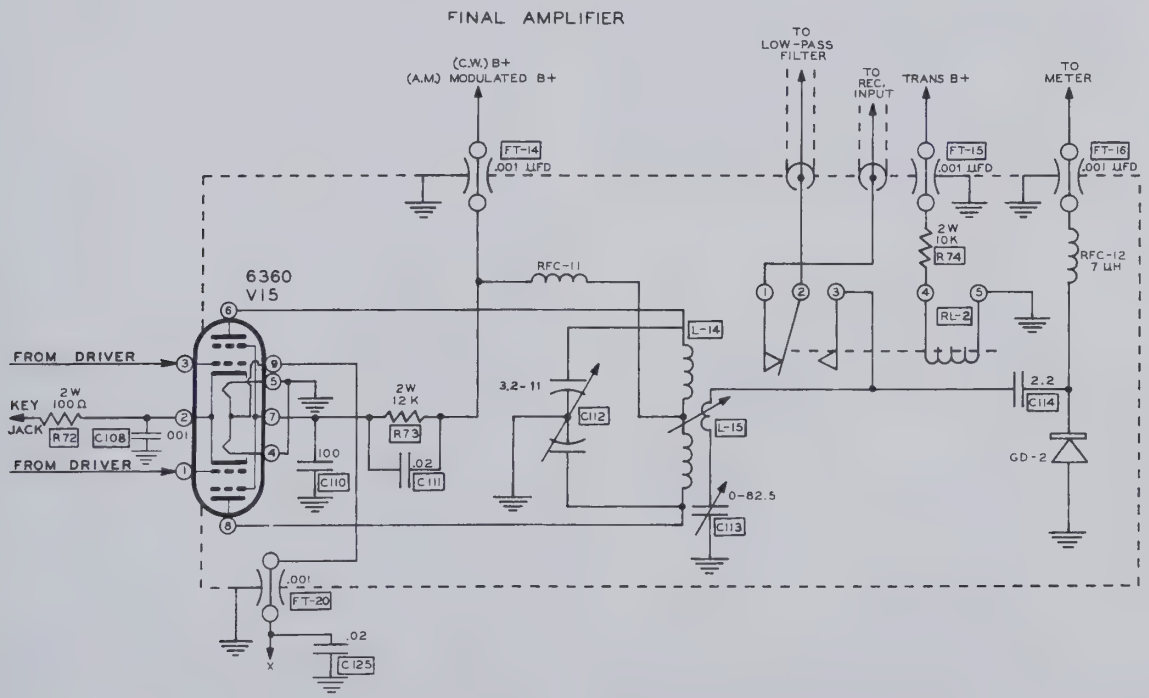


Figure 12

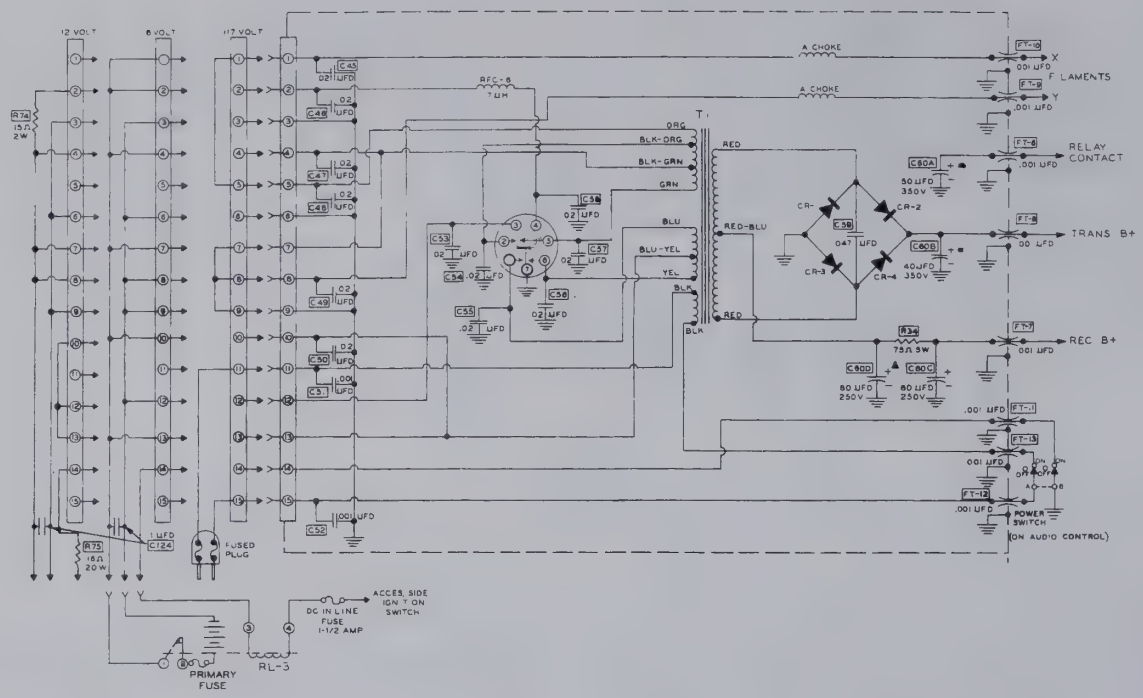


Figure 14

A low-pass filter consisting of three sections is incorporated in the RF output line. As shown in Figure 13, each section is shielded from the other section and is completely enclosed in a shielded housing. This type of filter will not introduce appreciable power loss in the 6-meter range if the coaxial line going to the antenna is properly matched to 50-72 ohms. Such a filter has the property of passing all frequencies below its "cut-off" frequency, but simultaneously has large attenuation for all frequencies above the cut-off frequency, which is approximately 54 mc.

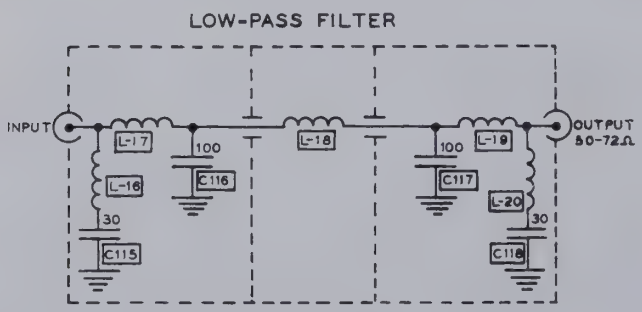


Figure 13

POWER SUPPLY SECTION

The Transceiver incorporates a three-way power supply capable of operating from a 117 volt AC, 12 volt DC, or 6 volt DC power source by merely using the proper power connector socket. The supply uses the new split-reed, dual-interrupter-type vibrator which overcomes the limited power-handling capabilities of older type vibrators. The supply is compact and highly efficient. The input power required by the supply is almost directly proportional to the output power drain, with only a small amount of power used to actuate the vibrator reeds.

The complete power supply is shown in Figure 14. Figures 15, 16, and 17 show in simplified form, the primary windings for 12 volts DC, 6 volts DC, and 117 volts AC, respectively. Referring to Figure 15 (12 volt connections), the vibrator has two sets of double-throw contacts (pins 1, 7, and 6 and pins 2, 3, and 5) which are electrically isolated from each other. The power transformer, T-1, has two center-tapped primary windings with each set of contacts switching the DC power alternately between halves of each primary winding. The windings are actually connected in series via the vibrator contacts. The contacts are never exposed to more than half the applied voltage, thus avoiding "flare" of the contacts so common when more than 8 volts is being switched. Resistor R74 in series with the vibrator driver coil provides proper operating voltage for the coil. The RF choke, RFC-6, offers high impedance to any

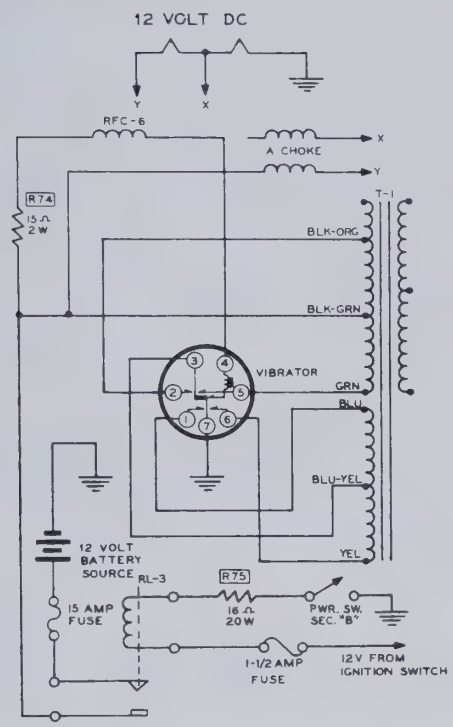


Figure 15

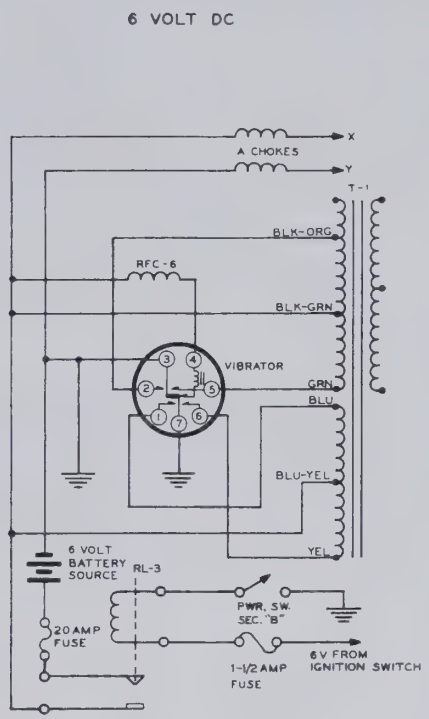


Figure 16

"hash" that may be fed back on the primary power line. The primary power relay coil, RL-3, is designed for 6 volt DC operation. With dropping resistor R75 in series, it also allows 12 volt DC operation of the relay. A SPST switch (Sec. B on the AUDIO gain control) applies power to the relay actuating the contacts which handle all the primary power to the Transceiver unit.

For 6 volt DC operation, jumpers in the power connector socket place the two primary windings in parallel. The simplified circuit is shown in Figure 16. Vibrator operation is the same as with the 12 volt system except that the two primary windings are now in parallel instead of series connected, and the two dropping resistors, R74 and R75, have been deleted.

When the power supply operates from 117 volts AC, a separate primary winding is incorporated and a second set of contacts on the power switch (Sec. A, located on the AUDIO gain control) applies power to the unit. The vibrator is inoperative and one of the DC primary windings with a properly placed tap is used to provide 6 volts of filament voltage when operating from a 117 volt AC source. Figure 14 shows the various wiring connections in the power connector sockets that accomplish the switching changes discussed. These differences will be self-evident after careful study.

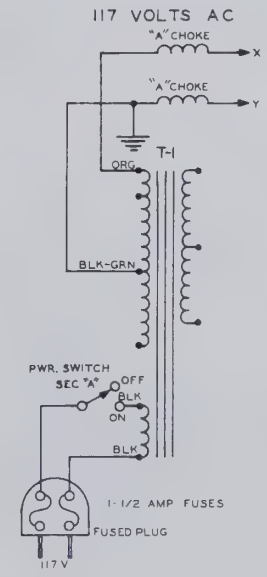


Figure 17

Filament type "A" chokes are employed in each filament line to prevent any "hash" developed by the vibrator from reaching the receiver and audio circuits. The power supply section is completely enclosed by shielding and all power leads leaving the section are bypassed by feed-through capacitors FT-6 through FT-13. All the primary circuits connected to the power plug are bypassed by capacitors C45 through C58 to keep vibrator hash from getting back into the primary power lines, and also to keep external noise interference from getting into the unit via these paths.

The Transceiver is protected by fuses for all power sources. For 117 volts AC operation, a pair of 1-1/2 ampere fuses in the line cord plug are used for protection. When operating from a DC power source, the primary relay, RL-3, has provisions for fusing the primary circuit on the relay itself. Also the relay coil is protected by an in-line fuse from the ignition switch.

RECTIFIER SECTION

Four silicon diodes are employed for rectification of the AC voltage developed across the center tapped secondary of the power transformer. Two output voltages are developed from the common secondary winding; 125 volts DC for the receiver and audio sections, and 250 volts DC for the transmitter and modulator circuits. Figures 18 and 19 show the rectifier systems in simplified form with either high or low voltage selectable by changeover relay RL-1. Also see Figure 20 under Relay and Switching Circuits.

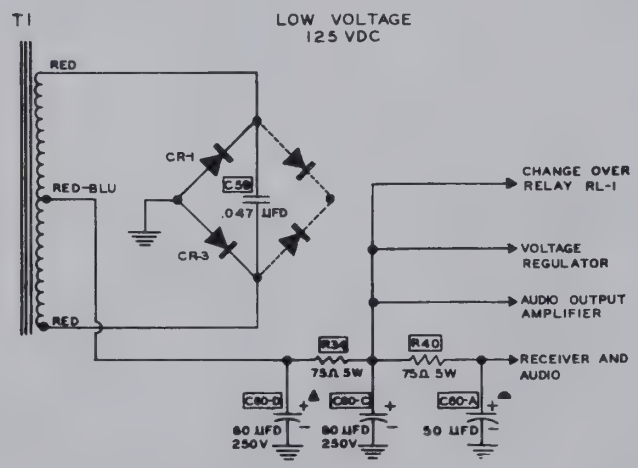


Figure 18

Figure 18 shows the full transformer secondary voltage applied to a full-wave rectifier, consisting of two silicon diodes, CR-1 and CR-3, with the anodes connected to ground. The rectified voltage is taken from the center tap and filtered by an RC network consisting of R34, R40, C60-D, C60-C, and C60-A. The output voltage is distributed as shown with the Transceiver in receive.

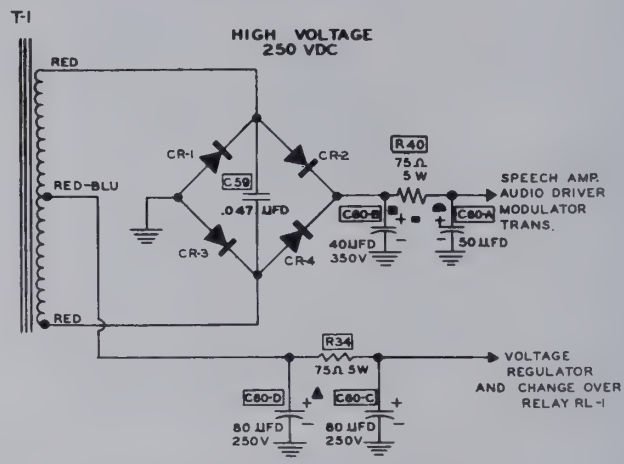


Figure 19

When the Transceiver changeover relay, RL-1, is energized for either transmit or public address operation, a set of relay contacts connects a portion of the RC filter network, R40 and C60-A, to the output of a full-wave bridge rectifier consisting of four silicon diodes, CR-1, CR-2, CR-3, and CR-4. It will be seen from the figures that two of the diodes, CR-1 and CR-3, in the full-wave rectifier are used in the bridge circuit and develop twice the voltage over the full-wave system using the same secondary winding. The B- return for both the high and low-voltage supplies is the ground point junction of CR-1 and CR-3. The same low voltage is always supplied to the voltage regulator and changeover relay regardless of whether the Transceiver is in transmit or receive.

A timing (buffer) capacitor, C59, is connected across the secondary winding and, with the value selected, provides good buffering to the vibrator when operating on DC primary voltages.

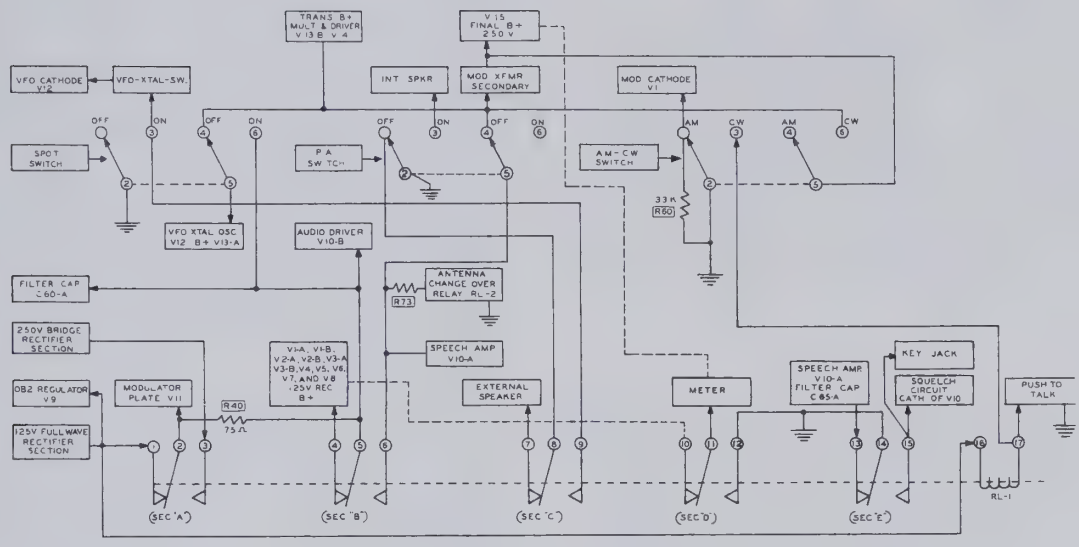


Figure 20

RELAY AND SWITCHING CIRCUITS

Transmit-receive changeover relay RL-1, antenna changeover relay RL-2 and the switching circuits are shown in the block diagram as Figure 20. The relay coils are of the DC type, operating from 125 volts. Relay coil RL-1 is energized by depressing the push-to-talk button on the microphone or by placing the AM-CW switch in the CW position, which grounds one end of the relay circuit. Relay coil RL-2 is energized when B+ voltage is applied for transmitter or PA operation.

With relay coil RL-1 de-energized or with the Transceiver in receive, the function of each section of contacts in the circuit is outlined below:

SECTION A

125 volts B+ from the full-wave rectifier section is applied to the voltage regulator, V9, relay coil RL-1 (lug 16), and relay contact lug 1. From contact 1 through contact 2, the B+ is applied to the modulator plate circuit, V11, and to the filter network, R40 and C60-A.

SECTION B

From filter resistor R40, the B+ is applied to the audio driver stage V10-B, to lug 6 on the SPOT switch and contact 5. From contact 5 through contact 4, the B+ is applied to all tubes in the receiver section.

SECTION C

External speaker jack is shorted to ground through contacts 7 and 8, and lugs 2 and 1, of the PA switch.

SECTION D

Contacts 10 and 11 place the meter in the receiver circuit to indicate relative signal strength. Also see Figure 21.

SECTION E

Contacts 13 and 14 short filter capacitor C65-A in the speech amplifier plate circuit to ground, to avoid feedback and hum during fast push-to-talk operation.

Depressing the push-to-talk button on the microphone energizes the relay coil RL-1 and initiates the sequence outlined below:

SECTION A

The low voltage, 125 volts, is removed from the modulator plate circuit and the RC filter network. These two circuits are now switched over to 250 volts from the bridge rectifier section through contacts 3 and 2.

SECTION B

From filter resistor R40, the high-voltage B+ is applied to the audio driver, lug 6 on the SPOT switch, and to relay contact 5. From contact 5 through contact 6, the high-voltage B+ is applied to speech amplifier V10-A, antenna changeover relay RL-2, and to all tubes in the transmitter section via lugs 5 and 4 on the PA switch. The high-voltage B+ on the VFO stage, V12, and crystal oscillator stage, V13-A, is applied via lugs 5 and 4 on the SPOT switch. The B+ on the final RF amplifier, V15, is supplied through the modulation transformer secondary winding. It is also applied to lug 6 on the AM-CW switch.

SECTION C

Contacts 8 and 9 complete the VFO cathode circuit to ground, via lugs 1 and 2 of the PA switch.

SECTION D

Contacts 11 and 12 place the meter in the transmitter circuit to indicate relative power output. Also see Figure 22.

SECTION E

Contacts 14 and 15 place the cathode of audio driver V10-B at ground potential. The cathode is normally above ground for squelch operation. These contacts also complete the cathode circuits of tripler V13-B, driver V14, and final RF amplifier, V15, in the transmitter section via the closed circuit key jack.

Placing the AM-CW switch in the CW position also energizes relay coil RL-1 by grounding lug 17 on the relay coil via lugs 3 and 2. At the same time, the modulator cathode resistance is increased by unshorting R60 to cut this stage off during CW operation. Lugs 5 and 6 of the switch short out the secondary winding of the modulation transformer and apply the high-voltage B+ directly to the final RF amplifier.

Placing the PA switch to the ON position removes all B+ from the transmitter section via lugs 4 and 5. At the same time, the internal speaker is shorted to ground via contacts 3 and 2 and the external speaker jack is unshorted for PA use.

Placing the SPOT switch to the ON position supplies low-voltage B+ to the VFO, V12, and to crystal oscillator stage V13-A via lugs 5 and 6. At the same time, it completes the VFO cathode circuit to ground via lugs 2 and 3.

METER CIRCUITS

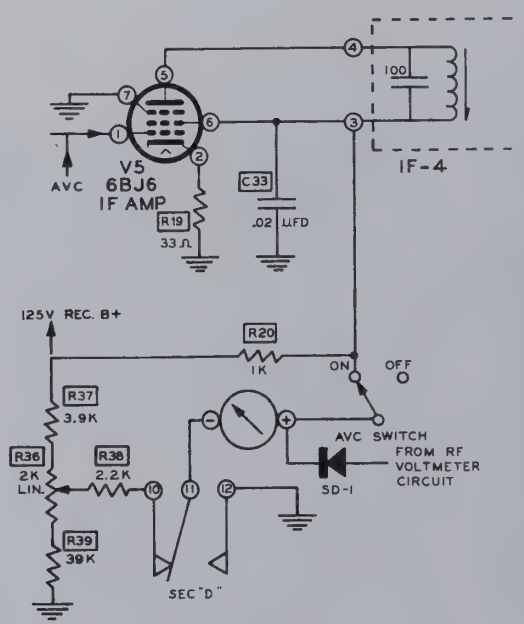


Figure 21

Figure 21 shows the meter circuit as incorporated in the receiver to read relative signal strength. The meter is used in an unbalanced bridge circuit with the DC plate resistance of IF amplifier V5 as one leg of the bridge. R20, R37, and R39 make up the other three legs. The meter indicates the change in plate current of the IF amplifier due to the action of the

applied AVC voltage. The meter is switched into the receiver circuit by the relay contact section D. The current path through the meter is removed when the AVC switch is placed at the OFF position.

When the transmitter section is energized, the negative lead of the meter is placed at ground potential by relay contact section D and the circuit becomes an RF voltmeter as shown by Figure 22. Germanium diode GD-2 rectifies a minute portion of the RF output signal coupled over by capacitor C114. The rectified voltage is filtered by RFC-12, and FT-16 for RF. The output of this portion of the circuit is DC varying in amplitude at an audio rate with modulation, and is fed to the meter through dropping resistor R45 to provide about 1/2 scale deflection of the meter from the carrier signal only. The audio components corresponding to modulation are coupled to a second germanium diode, GD-1, through capacitor C62. The rectified audio is impressed on the meter through dropping resistor R46, causing it to swing from the carrier level towards full scale with modulation. Silicon diode SD-1 in series with the

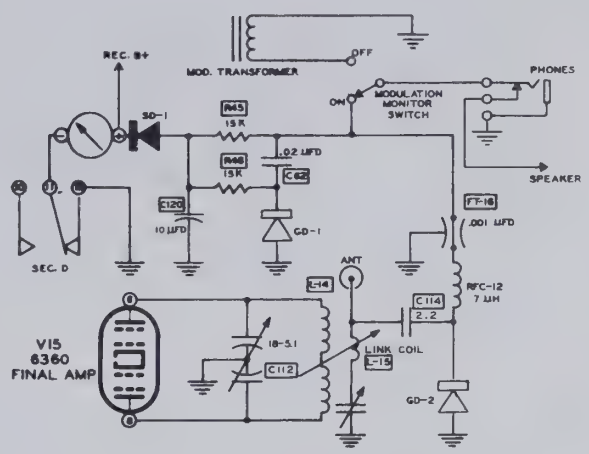


Figure 22

meter acts as a "gate." It prevents the receiver B+ from being shorted to ground through the RF voltmeter circuit, but allows the DC voltage developed from this circuit to be impressed across the meter. The modulated carrier can also be monitored by placing the MOD. MONITOR switch to the ON position and inserting a set of headphones in the PHONE jack.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be a stable instrument, operating at a high degree of dependability. We suggest that you retain the manual in your files for future reference, both in the use of the instrument and for its maintenance.

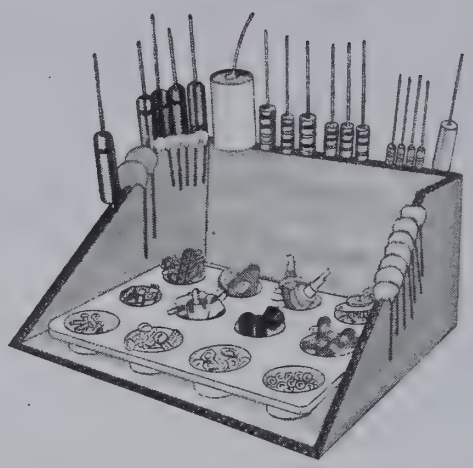
UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the charts and other information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the Replacement section and supply the information called for therein. Include all inspection slips in your letter to us.

Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.

2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4 blade; a small screwdriver with a 1/8 blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a pen knife or a tool for stripping insulation from wires; a soldering iron (or gun) and rosin core solder. A set of nut drivers and a nut starter, while not necessary, will aid extensively in construction of the kit.



Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.

PARTS LIST

Refer to fold-out Parts Pictorial on Page 27 for identification of parts.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS		
Carbon		
1-9	8	1 KΩ 1/2 watt (brown-black-red)
1-11	1	1.5 KΩ 1/2 watt (brown-green-red)
1-20	3	10 KΩ 1/2 watt (brown-black-orange)
1-21	2	15 KΩ 1/2 watt (brown-green-orange)
1-22	1	22 KΩ 1/2 watt (red-red-orange)
1-24	4	33 KΩ 1/2 watt (orange-orange-orange)
1-25	6	47 KΩ 1/2 watt (yellow-violet-orange)
1-26	10	100 KΩ 1/2 watt (brown-black-yellow)
1-27	1	150 KΩ 1/2 watt (brown-green-yellow)
1-29	2	220 KΩ 1/2 watt (red-red-yellow)
1-30	2	270 KΩ 1/2 watt (red-violet-yellow)
1-33	4	470 KΩ 1/2 watt (yellow-violet-yellow)
1-35	6	1 megohm 1/2 watt (brown-black-green)

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS (Cont'd.)		
1-37	3	2.2 megohm 1/2 watt (red-red-green)
1-44	1	2.2 KΩ 1/2 watt (red-red-red)
1-46	1	3.9 KΩ 1/2 watt (orange-white-red)
1-47	2	56 KΩ 1/2 watt (green-blue-orange)
1-67	2	39 KΩ 1/2 watt (orange-white-orange)
1-84	1	62 Ω 1/2 watt (blue-red-black)
1-103	2	33 Ω 1/2 watt (orange-orange-black)
1A-3	1	3.3 KΩ 1 watt (orange-orange-red)
1B-3	1	10 KΩ 2 watt (brown-black-orange)
1B-15	1	1 KΩ 2 watt (brown-black-red)
1B-20	3	100 Ω 2 watt (brown-black-brown)
1B-22	1	12 KΩ 2 watt (brown-red-orange)
1B-28	1	15 Ω 2 watt (brown-green-black)

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS (Cont'd.)		
Wire-wound		
2-96	1	5.55 Ω 1/2 watt 1% precision
3E-10	1	110 Ω 5 watt
3E-15	2	75 Ω 5 watt
3X-3	1	16 Ω 24 watt
CAPACITORS		
Mica-Ceramic-Phenolic		
20-77	1	24 μμf 500 V mica 5%
20-96	1	36 μμf 500 V mica 5%
20-97	1	50 μμf 500 V mica 5%
20-99	2	22 μμf 500 V mica 5%
20-100	2	30 μμf 500 V mica 5%
20-102	8	100 μμf 500 V mica 5%
20-107	2	680 μμf 500 V mica 5%
21-3	2	10 μμf 500 V disc ceramic 10% NPO
21-6	1	27 μμf 500 V disc ceramic 10% NPO
21-7	1	33 μμf 500 V disc ceramic
21-14	19	.001 μfd 500 V disc ceramic
21-16	1	.01 μfd 500 V disc ceramic
21-27	3	.005 μfd 500 V disc ceramic
21-31	43	.02 μfd 500 V disc ceramic
21-32	2	47 μμf 500 V disc ceramic 10% N750
21-33	1	3.3 μμf 500 V disc ceramic 10% NPO
21-51	1	20 μμf 500 V disc ceramic 5% NPO
21-53	20	.001 μfd 500 V feed-through ceramic
21-56	1	470 μμf 500 V disc ceramic 10%
21-65	1	25 μμf 500 V tubular ceramic 5% N750 (violet-red-green-black--green)
21-66	1	50 μμf 500 V tubular capacitor 5% N750 (violet--green-black-black-green)
21-71	2	.001 μfd 1400 V disc ceramic (U)
21-75	3	100 μμf 500 V disc ceramic 10%
21-87	1	10 μμf 500 V tubular ceramic stud mount 5% N220 (yellow-brown-black--black)
21-89	1	20 μμf 500 V tubular ceramic 5% NPO (black-red-black-black--green)
28-1	2	2.2 μμf tubular phenolic (red-red-white)
28-3	2	0.56 μμf tubular phenolic (green-blue-gray)
CAPACITORS (Cont'd.)		
Mica-Ceramic-Phenolic		
Paper-Electrolytic-Mylar		
23-91	1	.047 1600 V oil filled paper (buffer)
25-3	1	8-8 μfd 475 V electrolytic-dual
25-35	2	2 μfd 50 V electrolytic
25-54	1	10 μfd 10 V electrolytic
25-85	1	50 μfd 25 V electrolytic
25-110	1	50-40-80-80 μfd at 350-350-250-250 V electrolytic (twist-prong mount)
27-19	1	1 μfd 200 V mylar (oval)
Variable Trimmers		
26-24	1	20 μμf variable air-trimmer
26-43	1	7+14 μμf variable (dual)
26-50	1	82.5 μμf variable with slotted shaft
26-68	2	5-15 μμf per section, 3-gang variable
26-39	1	3.2-11 μμf per section variable (butterfly)
26-70	1	2.7-19.6 μμf per section variable (differential)
31-17	2	5-25 μμf trimmer NPO
31-21	5	1.5-10 μμf tubular ceramic trimmer
31-27	1	8-50 μμf trimmer N750
COILS-CHOKES		
40-330	1	20-24 mc oscillator coil
40-331	1	2 mc BFO coil
40-343	1	RF input coil
40-346	1	Driver coil
45-4	1	1.1 mh RF choke
45-20	2	"A" choke
45-36	3	7 μh RF choke
141-15	1	Coil set, consisting of:
40-124	1	VFO plate coil
40-126	1	Multiplier plate coil
45-31	2	11 μh RF choke
45-33	1	305 μh RF choke
45-39	1	.45 μh RF choke
141-16	1	Coil set, consisting of:
40-342	2	6-meter slug tuned RF coil

PART No.	PARTS Per Kit	DESCRIPTION
COILS-CHOKES (Cont'd.)		
40-206	1	XTAL oscillator coil
40-329	1	VFO coil
141-17	1	Coil set, consisting of
40-344	1	Transmitter doubler coil
40-345	1	Link coupling coil
40-340	2	Filter termination coil
40-339	3	Filter center-leg coil
140-26	1	Final tank coil
TRANSFORMERS		
51-61	1	Driver transformer
51-62	1	Combination modulation output transformer
52-40	3	2 mc IF transformer
52-42	1	22-26 mc IF transformer
55-4	1	Vibrator and AC power transformer
CONTROLS-SWITCHES-RELAYS		
10-52	1	2 KΩ linear taper with tab mount
10-65	1	2 KΩ linear taper with dummy lug
19-59	1	1 megohm audio taper with DPST switch
19-60	1	10 KΩ linear taper with SPST push-pull switch
19-61	1	50 KΩ linear taper with SPST push-pull switch
19-62	1	500 KΩ audio taper with DPDT push-pull switch
60-4	1	SPDT slide switch with tapped holes
60-13	3	DPDT slide switch with untapped holes
63-242	1	5-position rotary switch
69-16	1	5-PDT 125 V DC relay
69-17	1	SPDT 125 V DC relay
69-18	1	SPST 6 V DC relay with fuse block
DIODES-VIBRATOR-TUBES-LAMPS		
56-4	2	Germanium diodes (red-green-violet)
56-5	2	Silicon diodes (red-red-blue)

PART No.	PARTS Per Kit	DESCRIPTION
DIODES-VIBRATOR-TUBES-LAMPS (Cont'd.)		
57-27	4	Silicon diodes, 500 ma, 500 V PIV rectifier
68-6	1	6/12 V DC vibrator
411-26	1	12AX7 or 12AX7A tube
411-42	1	6AK6 tube
411-46	1	OB2 tube
411-68	1	6AN8 or 6AN8A tube
411-95	1	6BH6 tube
411-121	1	6BS8 tube
411-124	2	6EA8 tube
411-131	1	6DZ7 tube
411-141	3	6BJ6 tube
411-144	2	6AQ6 tube
411-145	1	6360 tube
412-4	2	#50 pilot lamps
GEARS-SHAFTS-BUSHINGS-PULLEYS		
451-15	2	Brass drive gear
451-16	3	Anti-backlash gear
453-56	2	1/4" x 1-3/8" dial cord drive shaft
453-94	1	1/4" x 3-1/16" phenolic extension shaft
453-95	1	1/4" x 4-9/16" phenolic link support shaft
453-96	1	3/16" x 8" switch extension shaft
453-97	1	1/4" x 1-1/2" slotted dial cord drive shaft
453-98	1	17/64" x 5-1/2" tubular brass shaft
453-99	2	1/4" x 3-5/8" dial pulley shaft
453-100	1	1/4" x 1-1/32" with machined pulley, final dial cord drive shaft
455-6	7	1/4" long round flange bushing
455-10	2	17/64" ID x 3/8" long hex flange bushing
455-11	2	Split bushing
455-15	1	Retainer bushing
455-26	2	1/4" ID x 1/2" long hex flange bushing
455-28	1	3/16" ID x 3/8" long hex flange bushing
456-7	3	1/4" - 1/4" shaft coupling

PART No.	PARTS Per Kit	DESCRIPTION
GEARS-SHAFTS-BUSHINGS-PULLEYS (Cont'd.)		
466-13	1	3/16" ID x 9/16" string diameter machined pulley
466-14	1	1/4" ID x 9/16" string diameter machined pulley
100-M70	2	Large dial pulley
100-M286	2	Small dial pulley
INSULATORS-GROMMETS-CLAMPS-TERMINAL STRIPS		
71-5	4	Ceramic standoff insulator (stud-mounted)
73-1	5	3/8" rubber grommet
73-2	1	3/4" rubber grommet
73-3	4	1/2" rubber grommet
73-4	2	5/16" rubber grommet
207-3	2	1/8" plastic clamp
207-4	3	1/4" plastic clamp
207-5	1	3/16" plastic clamp
207-6	1	Vibrator grounding clamp
207-19	6	5/16" plastic clamp
207-35	1	Microphone cable clamp
431-2	2	2-lug terminal strip (no ground)
431-3	1	3-lug terminal strip (no ground)
431-11	1	5-lug terminal strip
431-14	2	2-lug terminal strip
431-16	1	2-lug terminal strip
431-38	6	3-lug (miniature) terminal strip
431-39	7	5-lug (miniature) terminal strip
431-42	1	5-lug (wide spaced) terminal strip
431-45	1	6-lug terminal strip
CONNECTORS-SOCKETS-JACKS-PLUGS		
432-23	1	Microphone connector-female
432-24	1	Microphone connector-male
432-34	1	Power connector - male
432-35	2	Power connector - female
434-36	5	9-pin miniature ceramic tube socket (shielded)
434-43	1	9-pin miniature phenolic tube socket (shielded)
434-35	2	7-pin miniature ceramic tube socket (shielded)
434-91	6	7-pin miniature phenolic tube socket (shielded)

PART No.	PARTS Per Kit	DESCRIPTION
CONNECTORS-SOCKETS-JACKS-PLUGS (Cont'd.)		
434-111	1	7-pin vibrator socket
434-39	1	Octal tube socket
434-38	4	Crystal socket
434-42	3	Phono socket
434-82	1	Phono socket - double
434-M115	2	Pilot lamp socket
436-4	2	Phone jack
436-5	1	Coaxial jack
438-4	5	Phono plug
438-11	1	AC fused plug
TUBE SHIELDS-KNOBS-TOOLS		
206-135	1	2-3/4" 9-pin tube shield with heat dissipator insert
206-3	5	2" 9-pin tube shield
206-44	1	2-1/4" 7-pin tube shield
206-25	7	1-3/4" 7-pin tube shield
206-43	1	Coaxial jack shield
462-158	2	1-3/4" die-cast knob
462-129	2	1-7/32" die-cast knob
462-130	4	11/32" die-cast knob
462-82	1	Plastic knob-black
490-1	1	Plastic alignment tool
490-4	1	#28 drill bit
490-5	1	Nut starter
490-6	1	Allen wrench
490-19	1	End wrench
205-254	1	Alignment tool blade
WIRE-CABLE-SLEEVING-FUSE HOLDER		
134-24	1	Cable assembly
89-4	1	Length line cord
340-2	1	Length #20 bare wire
340-3	1	Length #16 bare wire
343-2	1	Length coaxial cable (RG-58A/U)
343-4	1	Length shielded wire
344-1	1	Length black hookup wire
	1	Length red hookup wire
	1	Length white hookup wire
344-15	1	Length black stranded hookup wire
345-1	1	Length braid (tinned copper)
345-2	1	Length braid (plain copper)
347-13	1	Length #12, 2-conductor cable
346-1	2	Length sleeving, small insulating
346-5	1	3" length sleeving, 1/4" diameter
423-6	1	Fuse holder (in-line) with 10 ft. lead

HARDWARE

PART No.	PARTS Per Kit	DESCRIPTION
Machine Screws		
250-63	8	3-48 x 1/8" round head screw
250-49	62	3-48 x 1/4" binder head screw
250-25	6	4-40 x 1/8" Fillister head screw
250-34	4	4-40 x 1/2" round head screw
250-56	60	6-32 x 1/4" binder head screw
250-26	4	6-32 x 5/8" binder head screw
250-134	5	6-32 x 3/4" round head screw (brass)
250-79	2	6-32 x 1-1/4" round head screw
250-50	4	10-32 x 3/8" Phillips head screw
250-126	2	10-32 x 1/2" Truss head screw
250-152	2	10-24 x 3/4" round head screw
Sheet Metal Screws-Studs-Spade Bolts		
250-8	90	#6 x 3/8" sheet metal screw
250-35	4	#8 x 7/8" sheet metal screw
250-83	8	#10 x 1/2" slotted acorn head sheet metal screw
250-84	2	8-32 x 7/8" screw stud
251-1	4	6-32 spade bolt
Setscrews		
250-22	1	8-32 x 7/16" slotted head setscrew
250-33	6	6-32 x 1/8" slotted head setscrew
250-93	12	8-32 x 1/4" Allen head set-screw
250-105	6	8-32 x 1/8" Allen head set-screw
Nuts		
252-1	56	3-48 nut
252-3	75	6-32 nut
252-7	21	3/8-32 control nut
252-15	4	4-40 nut
252-19	5	6-32 palnut
252-28	2	8-32 thumbnut
252-30	2	10-24 hex nut
252-31	1	10-24 wing nut
252-49	2	10-32 thumbnut (shouldered)
Washers		
253-34	4	#6 x 3/32" thick fiber washer
253-5	4	#8 x 1/16" thick fiber washer
Washers (Cont'd.)		
253-6	4	#10 x 1/16" thick fiber washer
253-19	2	#10 x 1/16" thick steel washer
253-10	10	Control flat washer
253-11	10	"E" washer
253-36	9	Dished spring washer
Lockwashers		
254-7	90	#3 lockwasher
254-9	6	#4 lockwasher
254-6	85	#6 lockwasher
254-3	4	#10 lockwasher
254-15	2	#16 lockwasher
254-4	11	Control lockwasher (thick)
254-5	5	Control lockwasher (thin)
Solder Lugs		
259-1	4	#6 solder lug (large)
259-6	19	#6 solder lug (small)
259-11	4	#6 spade solder lug
259-16	4	#8 spade solder lug
259-10	5	Control solder lug
Miscellaneous		
255-13	4	#6 x 1/4" spacer
255-44	2	10-32 spacer (shouldered)
255-45	4	6-32 x 3-48 tapped phenolic spacer
258-1	2	Dial cord spring
260-7	6	IF transformer mounting clip
260-31	1	Fahnestock clip
260-32	2	Power plug locking clip
452-4	1	3/4" roll pin
Antenna Parts		
1142-34	1	Collapsible whip antenna
204-135	1	Small angle bracket
259-2	1	#8 solder lug
262-3	1	Banana plug
40-382	1	Antenna loading coil
73-28	1	Phenolic sleeve

NOTE: These parts should be set aside until they are called for in the Types Of Antennas section of the manual.

SHEET METAL PARTS

PART No.	PARTS Per Kit	DESCRIPTION
Brackets		
100-M284	1	Idler pulley bracket (right angle)

PART No.	PARTS Per Kit	DESCRIPTION
Brackets (Cont'd.)		
100-M302	5	Idler pulley bracket ("L" type)
204-M340	1	VFO tube mounting bracket
204-M341	1	Shaft support bracket
204-M344	1	Switch mounting bracket
204-M348	1	Relay resistor mounting bracket
204-M350F	1	Gimbal bracket
Plates		
100-M290F	1	Dial back plate
205-M87	1	Tube pin shield plate
205-M244	1	VFO "heat sink" plate
205-M245	1	VFO housing top plate
205-M246	1	Left-hand chassis partition plate
205-M247	1	Right-hand chassis partition plate
205-M248	1	Power supply shield plate
205-M249	1	Final amplifier shield plate
205-M250	1	Left-hand chassis end plate
205-M251	1	Right-hand chassis end plate
205-M252	1	Front panel support plate
205-M255	1	Chassis bottom plate
205-M257F	1	Crystal access plate
205-M276	2	Front panel brace plate
Housings		
100-M285	1	VFO housing-front panel
214-M9	1	VFO housing - back and side panel
214-M10	1	Low-pass filter base housing
214-M11	1	Low-pass filter cover housing

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous		
90-150	1	Cabinet
100-M289F	392-429 1	Front panel
200-M273F	388 1	Chassis
200-M281	1	Receiver subchassis
206-M134	2	Low-pass filter partition shield
266-18	2	Rotational stop
481-1	1	Capacitor mounting wafer
MISCELLANEOUS		
100-M287	1	Dial cord assembly, receiver 47" long
100-M288	1	Dial cord assembly, transmitter 40-3/8" long
349-1	1	Length dial cord
209-32	1	Speaker grille
401-40	1	Speaker (weatherproof)
261-6	4	Rubber feet
404-13	1	28 mc 3rd overtone crystal
407-74	1	Meter
421-1	2	1-1/2 ampere 3AG fuse
421-7	1	15 ampere 3AG fuse
421-18	1	20 ampere 3AG fuse
463-22	2	Dial pointer
464-15F	417 1	Plastic dial
480-14	1	Microphone with coil cord and mounting clip
595-396	1	Manual

PROPER SOLDERING TECHNIQUES

Only a small percentage of HEATHKIT equipment purchasers find it necessary to return an instrument for factory service. Of these instruments, by far the largest portion of malfunctions are due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For most wiring, a 30 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly over the joint. Keep the iron tip clean and bright by wiping it from time to time with a cloth.

CHASSIS WIRING AND SOLDERING

1. Unless otherwise indicated, all wire used is the type with colored insulation (hookup wire); the size of the conductor is the same for all colors of hookup wires furnished with this kit. In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the construction step.

2. To avoid breaking internal connections when stripping insulation from the leads of transformers or similar components, care should be taken not to pull directly on the lead. Instead, hold the lead with pliers while it is being stripped.

3. Leads on resistors, capacitors and similar components are generally much longer than they need to be to make the required connections. In these cases, the leads should be cut to proper length before the part is added to the chassis. In general, the leads should be just long enough to reach their terminating points.

4. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving. Where the use of sleeving is specifically intended, the phrase "use sleeving" is included in the associated construction step. In any case where there is the possibility of an unintentional short circuit, sleeving should be used. Extra sleeving is provided for this purpose.

5. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the wire is too large to allow bending or if the step states that the wire is not to be crimped, position the wire so that a good solder connection can still be made.

6. Position the work, if possible, so that gravity will help to keep the solder where you want it.

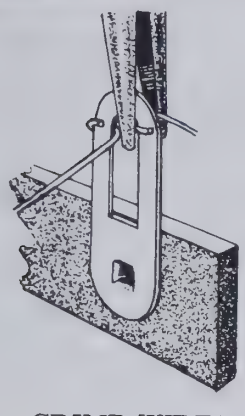
7. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

8. Then place the solder against the heated terminal and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.

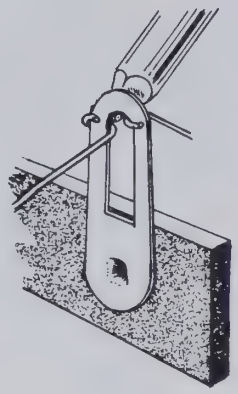
9. Remove the solder and then the iron from the completed junction. Use care not to move the leads until the solder is solidified.

A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly over the entire junction. In some cases, it may be necessary to add a little more solder to achieve a smooth bright appearance.

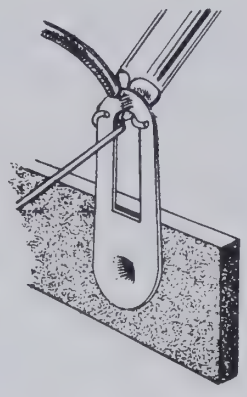
NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.



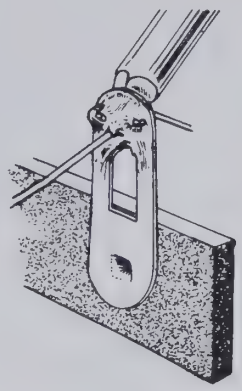
CRIMP WIRES



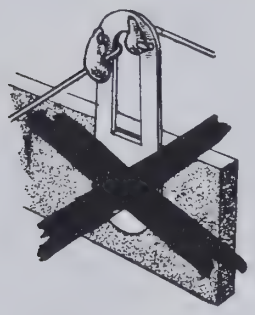
HEAT CONNECTION



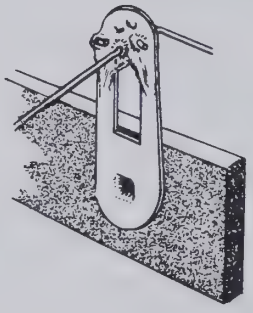
APPLY SOLDER



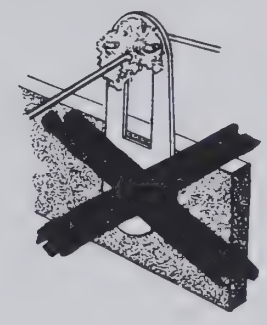
ALLOW SOLDER TO FLOW



COLD SOLDER JOINT CONNECTION INSUFFICIENTLY HEATED



PROPER SOLDER CONNECTION



COLD SOLDER JOINT CONNECTION MOVED WHILE COOLING

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each lead in colored pencil on the Pictorial as it is added.

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but, because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered. (In cases where a lead passes through a terminal or lug and then connects to another point, it will count as two leads, one entering and one leaving the terminal.)

The steps directing the installation of resistors include color codes to help identify the parts. Also, if a part is identified by a letter-number designation on the Schematic, its designation will appear in the construction step which directs its installation.

STEP-BY-STEP ASSEMBLY

PARTS MOUNTING ON MAIN CHASSIS

NOTE: For parts identification refer to the Parts Pictorial which is a fold-out from Page 27.

Refer to Pictorial 1 for the following steps.

( ) Locate and position the main chassis (#200-M273F388) with the large rectangular cut-out toward you and to the right as shown in Pictorial 1.

( ) Insert a 5/16" rubber grommet in hole A.

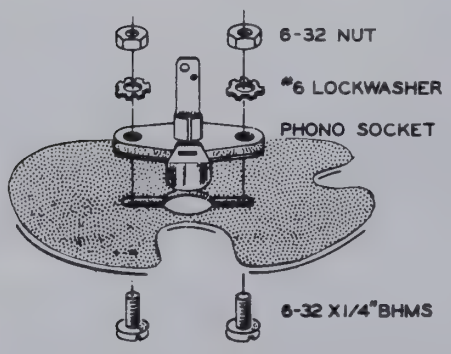
( ) Insert 3/8" rubber grommets in holes B, C, and D. Hole D is located on the front apron of the chassis.

( ) Insert a 1/2" rubber grommet in hole E. Hole E is also located on the front apron of the chassis.

( ) Insert a 3/4" rubber grommet in hole F.

NOTE: Lockwashers will be used with all screws and nuts when mounting parts unless otherwise stated. Consequently, the following steps will only call out the size and type of hardware to be used. IMPORTANT: This kit is designed for mobile application and will be exposed to shock and vibration. Thus, the use of lockwashers with all mounting hardware is important.

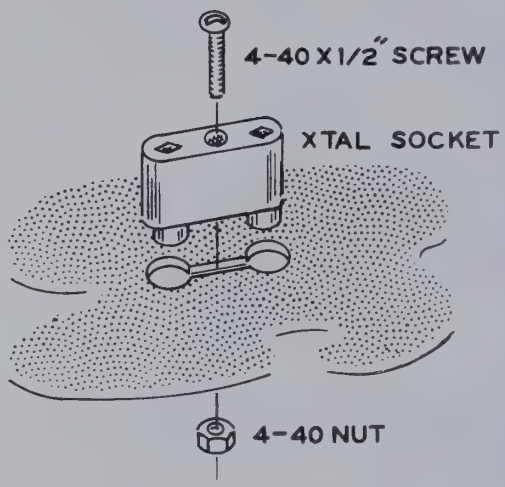
( ) Mount a phono socket at location AB using 6-32 x 1/4" hardware. See Detail 1A for mounting procedure.



Detail 1A

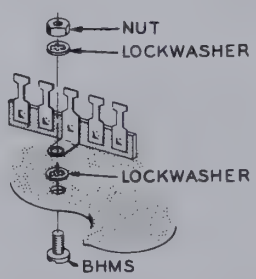
( ) Mount the double phono socket at location AC. Use 6-32 x 1/4" hardware.

( ) Mount the four crystal sockets at location X1, X2, X3, and X4. Use 4-40 x 1/2" hardware. Do not use lockwashers here. Allow the flat sides of the nuts to recess in the socket. Do not force the sockets or tighten the screws to extremes as the sockets may be broken. See Detail 1B.



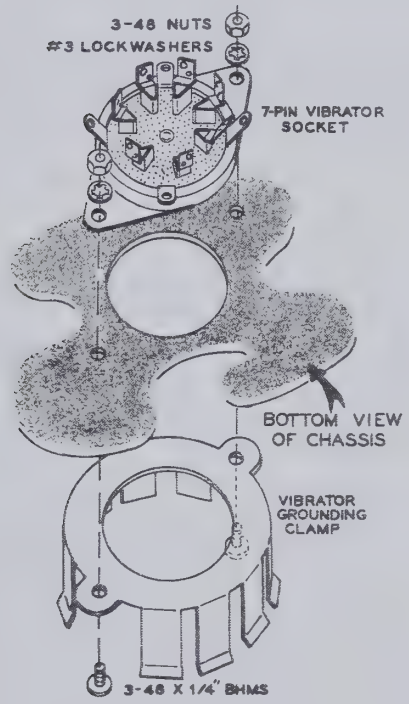
Detail 1B

( ) Locate the metal filter capacitor mounting wafer and mount it on the top side of the chassis at location AD. First, use 6-32 x 1/4" hardware at the mounting hole near the rear apron. Next, locate the large 5-lug terminal strip and mount it, positioned as shown at DD, at the other wafer mounting hole. Use 6-32 x 1/4" hardware with a lockwasher under the foot of the terminal strip and under the nut. See Detail 1C for terminal strip mounting procedure.



Detail 1C

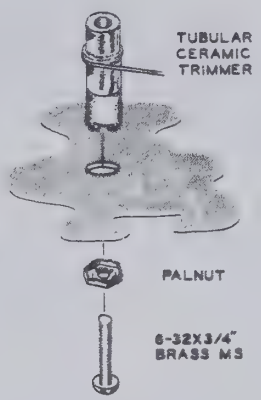
( ) Locate the 7-pin vibrator socket and the vibrator grounding clamp. Observe that the socket has two large pins. Mount the socket beneath the chassis, with the grounding clamp on top of the chassis at location AE. See Detail 1D. The two large pins are positioned near the rear apron of the chassis. Use 3-48 x 1/4" hardware. Before securing, make sure the socket and grounding clamp are centered over the chassis hole.



Detail 1D

CAUTION: When handling and mounting the following ceramic parts, be extra careful as they can be easily broken.

( ) Locate four 1.5-10 $\mu\mu$f tubular ceramic trimmer capacitors, four 6-32 palnuts, and four 6-32 x 3/4" brass screws. Start a palnut on one of the brass screws, insert the screw through hole TC-2 from the top side of the chassis, and start it into the tubular ceramic trimmer capacitor which mounts on the bottom of the chassis. Turn the screw about halfway into the trimmer and then tighten the palnut. Be sure the ridges on the ceramic trimmer are seated in the oblong hole before tightening the palnut. See Detail 1E.



Detail 1E

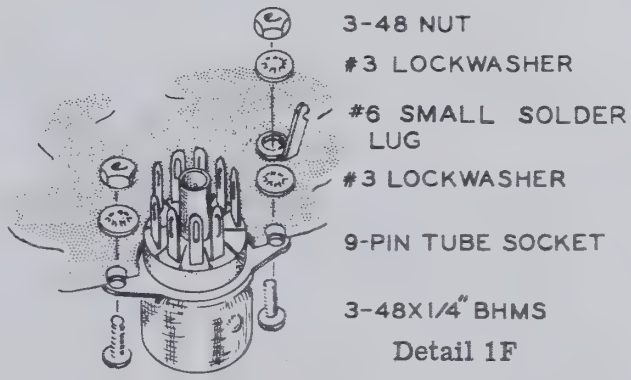
( ) Repeating the previous step, mount the other three trimmers at locations TC-3, TC-5, and TC-6.

( ) Locate the 8-50 $\mu\mu$f N750 ceramic trimmer capaictor and mount at PC-2. Mount the trimmer on the bottom of the chassis using 3-48 x 1/4" hardware as shown.

( ) In a like manner, mount the two 5-25 $\mu\mu$f NPO ceramic trimmer capacitors with mounting wafers and mount them at holes PC-1, and PC-4.

( ) Mount a miniature 5-lug terminal strip at location BB, using 3-48 x 1/4" hardware with lockwashers under the mounting foot and under the nut. Position as shown.

( ) Mount a 9-pin miniature ceramic shielded socket at location V3. The socket mounts from the top of the chassis, using 3-48 x 1/4" hardware. See Detail 1F for mounting procedure. Orient the socket so that the wide pin spacing is positioned as shown in Pictorial 1. Place a lockwasher on each screw, then a #6 small solder lug, and secure with a lockwasher under each nut. Bend the solder lugs up and position as shown.



Detail 1F

( ) Mount a 7-pin miniature phenolic shielded socket at location V4, with a #6 small solder lug on the screw near pin 7. Use 3-48 x 1/4" hardware. Bend the solder lug up as in the previous step.

( ) Mount a second 7-pin phenolic socket at location V5 with 5-lug miniature terminal strip NN on the screw near pin 7. Use 3-48 x 1/4" hardware. Position the terminal strip as shown.

( ) Mount a third 7-pin phenolic socket at location V6 with 5-lug miniature terminal strip PP on the screw near pin 7 and with a #6 small solder lug on the screw near pins 3 and 4. Use 3-48 x 1/4" hardware and position the components as shown.

( ) Mount a fourth 7-pin phenolic socket at location V7 with a #6 small solder lug on the screw near pins 3 and 4. Use 3-48 x 1/4" hardware.

( ) Mount a fifth 7-pin phenolic socket at location V8 with a #6 small solder lug on each mounting screw. Use 3-48 x 1/4" hardware and position the components as shown.

( ) Mount the remaining 7-pin phenolic socket at location V9 with 3-lug miniature terminal strip MM installed on the screw near pin 7, and with 5-lug miniature terminal strip LL on the screw near pins 3 and 4. Use 3-48 x 1/4" hardware and position as shown.

( ) Mount a 9-pin miniature phenolic socket at location V10 with a #6 small solder lug on the screw near pins 4 and 5. Use 3-48 x 1/4" hardware and position as shown.

( ) Mount the 8-pin octal socket at location V11 using 6-32 hardware. Be sure to orient the keyway as shown. Now bend ground lug 3 up next to the socket. This is to allow clearance for mounting of the driver transformer.

( ) Mount a 9-pin ceramic socket at location V13 with 5-lug miniature terminal strip AA on the screw near pins 4 and 5, and with a #6 small solder lug on the screw near pin 9. Use 3-48 x 1/4" hardware and position as shown.

( ) Mount a 7-pin ceramic socket at location V14 with a #6 small solder lug on each mounting screw. Use 3-48 x 1/4" hardware.

( ) Mount a 9-pin ceramic socket at location V15, using 3-48 x 1/4" hardware.

This completes the mounting of all tube sockets on the main chassis. Check to make sure that all sockets are oriented as shown on Pictorial 1, and that the #6 small solder lugs and terminal strips are positioned as shown.

( ) Locate the audio driver transformer (#51-61) and cut the leads to the following lengths before mounting. Measure from the point they leave the transformer.

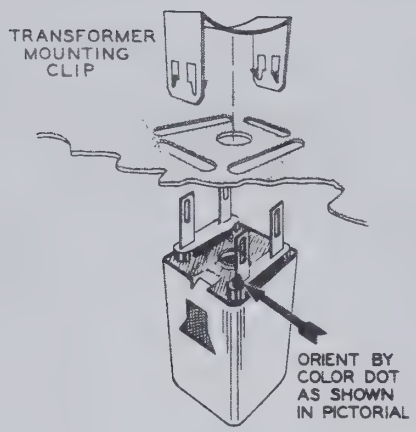
Both green leads - 2"
Green/black lead - 1"
Blue lead - 2-1/2"
Red lead - Do not cut.

( ) Avoid any strain on the leads from the transformer and strip 3/8" of insulation from each lead. Now tin each lead.

( ) Mount the driver transformer on the bottom of the chassis at location T-2 with the red and blue leads near tube socket V10. Insert 6-32 x 1/4" screws through the two mounting holes from the top of the chassis. Place a #6 lockwasher on each protruding screw, then install the transformer, and secure the mounting screw near the front apron of the chassis with a #6 lockwasher under the nut. On the remaining mounting screw, install 5-lug terminal strip HH. Position as shown and secure with a #6 lockwasher under the nut.

( ) Mount a 6-lug terminal strip at location GG. Use 6-32 hardware.

( ) Locate the 22-26 mc IF transformer (#52-42) and mount it at location IF-1. Install the IF transformer on the top side of the chassis with the color dot oriented as shown in Pictorial 1. While holding the IF transformer in place, press a mounting clip through the two narrow slots from the bottom of the chassis until it engages the cutouts on each side of the transformer. See Detail 1G.



Detail 1G

( ) Locate a 2 mc IF transformer (#52-40) and mount it at location IF-2 in the same manner as in the previous step. Make sure the color dot is oriented as shown.

( ) Mount a second 2 mc IF transformer (#52-40) at location IF-3.

( ) Mount the third 2 mc IF transformer (#52-40) at location IF-4.

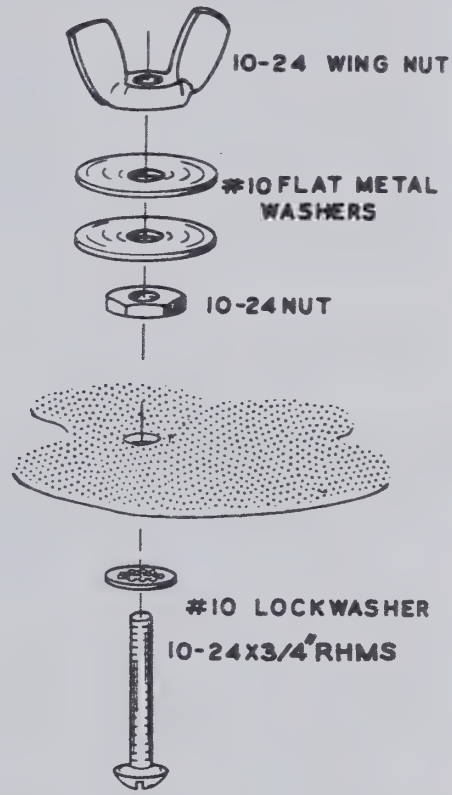
( ) Locate the 2 mc BFO coil (#40-331) and mount it at location L-8.

( ) Locate the 20-24 mc oscillator coil (#40-330) and mount the coil at location L-7.

( ) Locate the switch mounting bracket (#204-M344) and mount it on the bottom of the chassis at location SW. Use 6-32 x 1/4" hardware. Mount with the flange toward the crystal sockets.

( ) Locate the VFO-crystal selector switch (#63-242) and install it on the switch mounting bracket using a control lockwasher between the switch and bracket, and secure with a control nut. Orient as shown.

( ) Slip a #10 lockwasher over a 10-24 x 3/4" screw and mount it on the rear apron at the location marked GROUND. Insert the screw from the inside of the chassis apron. See Detail 1H. Secure with a 10-24 nut, then place the two #10 flat metal washers over the screw and start the 10-24 wing nut on the screw.



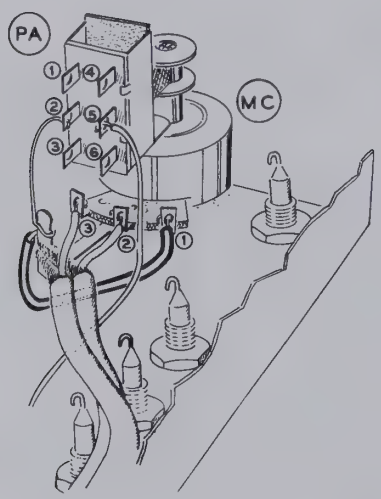
Detail 1H

Refer to Pictorial 2 for the following steps.

( ) Locate the power supply shield plate (#205-M248) and mount eight .001 μfd feed-through capacitors, using the nuts supplied with the capacitors. Insert the capacitors from the side with three flanges. Install FT-6 first, then FT-7, etc., with the hooks oriented as shown. Be careful when tightening the nuts to prevent breakage.

( ) Place a #6 lockwasher on a 6-32 x 1-1/4" screw and insert through hole J from the side shown. Hold in place until the control in the next step is installed. A choke will be mounted on this screw in a later step.

( ) R47. Locate the 500 KΩ audio control with the DPDT push-pull switch (#19-62). Place a control solder lug over the bushing of the control, plus a thick control lockwasher, and mount at location MC, using a control nut. Orient the solder lug and control as shown in Detail 2A.



Detail 2A

( ) Cut a #20 bare wire to 3". Connect one end to lug 1 of control MC (S-1). Slip a 1" length of sleeving over the wire, make a one turn wrap around the control solder lug (NS), and connect the other end to lug 2 of DPDT switch PA mounted on control MC (S-1).

( ) Cut two 7" lengths of gray shielded audio cable and prepare each end as shown in Detail 2B.

( ) Connect the center conductor of one of the prepared audio cables to lug 2 of control MC (S-1). Connect the outer shield to the control solder lug (NS).

( ) Connect the center conductor of the other prepared audio cable to lug 3 of control MC (S-1). Connect the outer shield to the control solder lug (S-4). Mark the other end of this cable with a pencil, scotch tape, or by some other means for identification later.

( ) Dress both cables near the control, making sure the outer shields do not short to lugs 2 or 3, and dress down along the feed-through capacitors. The other ends will be connected later.

Refer to Pictorial 2 for the following steps.

NOTE: In the next five steps, only one end of the stranded black hookup wire will be connected. The other ends will be connected at a later time. When soldering to the feed-through capacitors use extreme care. Do not overheat or apply strain as they can be easily broken. The following connections will be made on the control side of the shield plate.

( ) Cut a stranded black hookup wire to 6", strip both ends 3/8" and tin lightly. Connect one end to FT-13 (S-1).

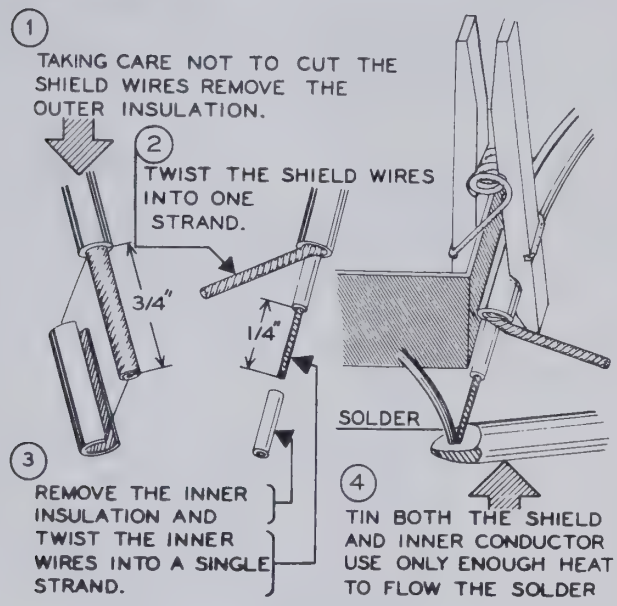
( ) Cut a stranded black hookup wire to 6-1/2", strip both ends 3/8" and tin lightly. Connect one end to FT-12 (S-1).

( ) Cut a stranded black hookup wire to 7", strip only one end 3/8" and tin lightly. Connect this end to FT-11 (S-1).

( ) Cut a stranded black hookup wire to 6-1/2", strip both ends 3/8" and tin lightly. Connect one end to FT-10 (S-1).

( ) Cut a stranded black hookup wire to 7", strip only one end 3/8" and tin lightly. Connect this end to FT-9 (S-1).

( ) Cut a white hookup wire to 2-1/2" and strip both ends 3/8". Connect one end to FT-8 on the relay side (S-1). The other end will be connected later.



Detail 2B

( ) Cut a red hookup wire to 4-1/4" and strip both ends 3/8". Connect one end to lug 5 of switch PA (S-1). See Detail 2A. Dress the wire down toward the shield plate and along the feed-through capacitors, to the left as shown. The other end will be connected later.

( ) Locate the 5-pole relay (#69-16) and carefully mount it on the shield plate at location RL-1. Mount on the same side that the control is mounted on, using 3-48 x 1/8" screws with #3 lockwashers placed on each screw. Position the relay as shown.

( ) Cut a red hookup wire to 3-3/4" and strip both ends 3/8". Connect one end to lug 16 of relay RL-1 (NS). Dress the wire down along the coil of the relay, along the shield plate, and connect it to FT-7 (S-1).

( ) Turn the power supply shield plate around so that the 1-1/4" screw at location J is toward you. The following connections are made from this side of the shield plate.

NOTE: In the next five steps only one end of the hookup wires will be connected.

( ) Cut a white hookup wire to 1-1/2" and strip both ends 3/8". Connect one end to FT-8 (S-1).

( ) Cut a red hookup wire to 3-1/2" and strip both ends 3/8". Connect one end to FT-7 (S-1).

( ) Cut a black hookup wire to 2-1/4" and strip both ends 3/8". Connect one end to FT-6 (S-1).

( ) Cut a stranded black hookup wire to 5-1/2", strip one end 1/8" and the other end 3/8". Tin both ends lightly and connect the 3/8" stripped end to FT-11 (S-1).

( ) Cut a second stranded black hookup wire to 6-1/2". Strip only one end 3/8" and tin lightly. Connect this end to FT-12 (S-1).

This completes the preliminary mounting of parts and wiring of the power supply shield plate. There should be wires connected to FT-6, FT-7, FT-8, FT-11, and FT-12 on the side of the shield plate with protruding screw J. On the relay side of the plate, there should be wires connected to FT-7, FT-8, FT-9, FT-10, FT-11, FT-12, and FT-13. Also, there should be two shielded cables connected to lug 2 and 3 of control MC and wires connected to lugs 2 and 5 of switch PA. The relay RL has one wire connected to lug 16.

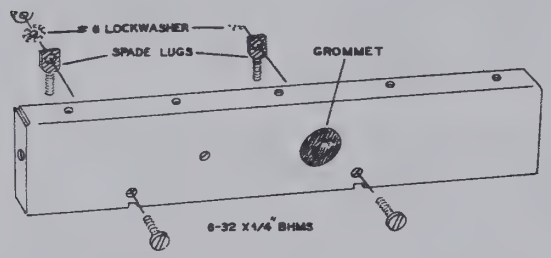
Now set the power supply shield plate aside.

ASSEMBLY OF THE PARTITION PLATES

Refer to Pictorial 3 for the following steps.

( ) Locate the left-hand partition plate (#205-M246) and mount two spade bolts from the side shown. Use 6-32 x 1/4" hardware.

( ) Install a 1/2" rubber grommet in the large hole of the partition plate.



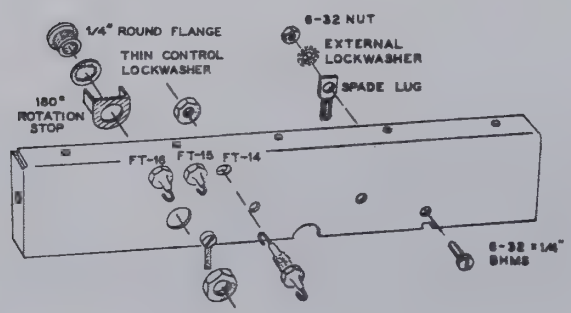
Pictorial 3

Refer to Pictorial 4 for the following steps.

( ) Locate the right-hand partition plate (#205-M247) and mount the other two spade bolts in the same manner as before. Use 6-32 x 1/4" hardware.

( ) Mount three .001 μfd feed-through capacitors at locations FT-14, FT-15 and FT-16. Insert each from the side shown and secure with the nuts supplied with the feed-through capacitors.

( ) Mount a 1/4" round flange bushing along with a 180 degree rotational stop. Use a thin control lockwasher between the flange of the bushing and the rotational stop. Insert the bushing from the side shown and secure with a control nut. Be sure to position the tabs on the rotational stop as shown.



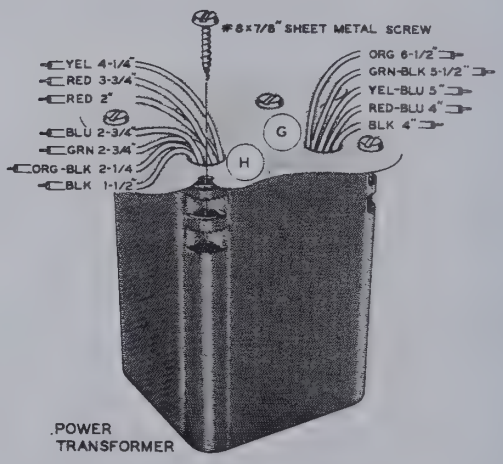
Pictorial 4

( ) Locate the power transformer (#55-4) and cut the leads to the following lengths before mounting. Measure from the point they leave the transformer. See Detail 5A.

COLOR	LENGTH
Orange	6-1/2"
Green-black	5-1/2"
Yellow-blue	5"
Red-blue	4"
Black (with group of 5)	4"
Yellow	4-1/4"
Red (either)	3-3/4"
Red (other)	2"
Green	2-3/4"
Blue	2-3/4"
Orange-black	2-1/4"
Black (with group of 7)	1-1/2"

( ) Strip 1/2" of insulation from the yellow-blue and green-black leads, and tin.

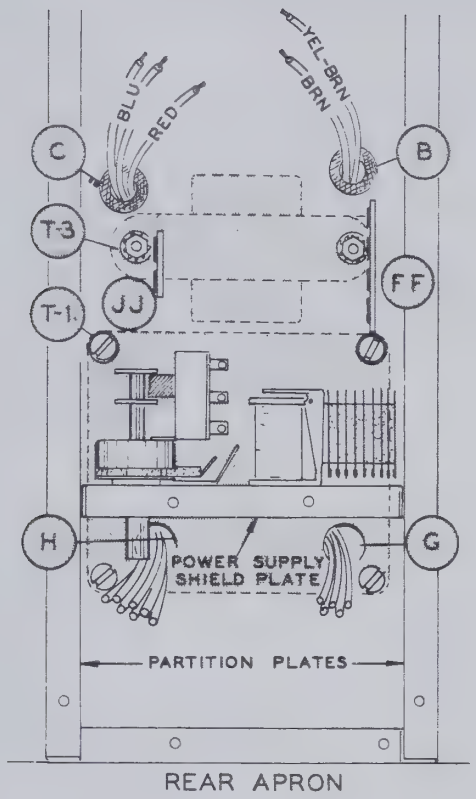
( ) Strip 3/8" of insulation from each of the other leads and tin.



Detail 5A

Refer to Pictorial 5 for the following steps.

( ) Position the transformer (bottom end up) with the leads leaving the transformer toward you. Now place the main chassis, with the rear apron toward you, over the transformer at location T-1. Feed the yellow-blue, green-black, red-blue, orange, and black leads through chassis hole G. Feed the other group of leads through chassis hole H. Be sure all the leads are dressed through the two holes.



Pictorial 5

( ) Now start the four #8 x 7/8" sheet metal screws into the transformer and secure the two screws near chassis holes G and H. Use at least a 9" or 10" length screwdriver with a 1/4" or larger blade to tighten these screws in place.

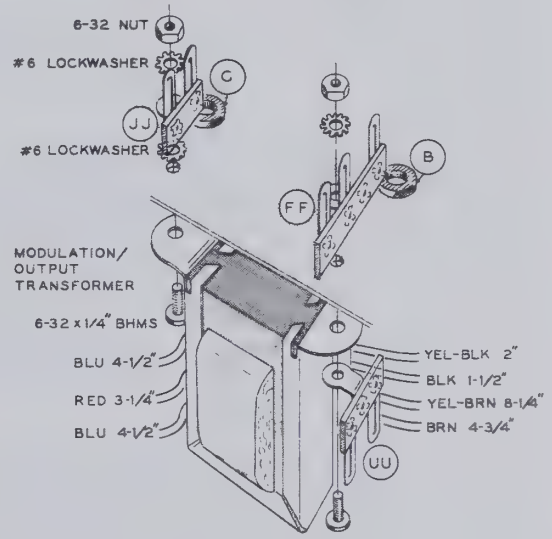
( ) Install the power supply shield plate on the bottom of the main chassis by slipping the two notches of the large flange under the other two transformer mounting screws. Position the shield plate with relay RL-1 and control MC facing toward the front apron of the chassis as shown. Before tightening the two #8 sheet metal screws, install the partition plate with the feed-through capacitors on the right side of the power supply shield plate. Do not secure in place. Install the other partition plate on the chassis to the left of the power supply shield plate. Again, do not secure in place. This is to make sure the power supply shield plate is properly centered. Now tighten the other two transformer mounting screws.

( ) Remove both partition plates from the main chassis and set them aside.

( ) Locate the combination modulation-output transformer (#51-62) and cut the leads to the following lengths. Measure from the point they leave the transformer. See Detail 5B.

COLOR	LENGTH
Blue	4-1/2"
Blue	4-1/2"
Red	3-1/4"
Brown	4-3/4"
Black	1-1/2"
Yellow-black	2"

The yellow-brown lead is left at the length as supplied.



Detail 5B

( ) Strip 3/8" of insulation from each lead and tin.

( ) Mount the transformer on top of the chassis at location T-3. Orient the transformer with the red and two blue leads near grommet C. Insert a 6-32 x 1/4" screw through the transformer mounting foot near this grommet and on through the chassis. Install 2-lug (one lug grounded) terminal strip JJ on the protruding screw and secure with a #6 lockwasher under the terminal strip mounting foot and one under the nut. Position the terminal strip as shown.

( ) Insert a 6-32 x 1/4" screw through the mounting foot of 2-lug terminal strip UU, see Detail 5B, then through the other transformer mounting foot. Install 3-lug terminal strip FF on the protruding screw and secure the assembly using a lockwasher under the nut.

( ) Feed the red and two blue leads through grommet C.

( ) Feed the brown and yellow-brown leads through grommet B.

POWER SUPPLY SECTION

Refer to Pictorial 6 (fold-out from Page 34) for the following steps.

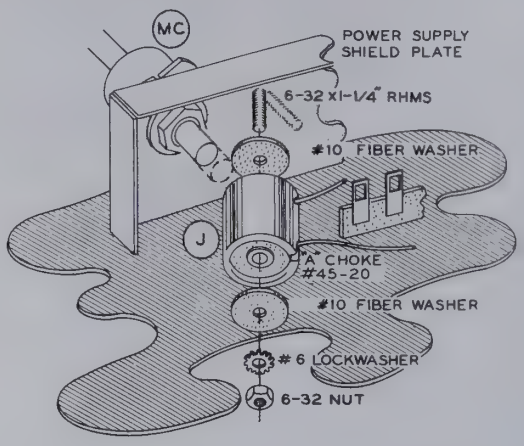
( ) Position the main chassis with the rear apron toward you.

( ) Dress the two black stranded leads coming from FT-11 and FT-12 toward hole G and group them with the transformer leads at this hole.

( ) C59. Locate the .047 μfd, 1600 volt DC buffer capacitor (#23-91) and form the leads at right angles near the ends of the capacitor. Insert the leads through the eyelets of lugs 1 and 5 of terminal strip DD. Position the capacitor next to the terminal strip and down on the chassis. Now wrap each lead around its respective lug and cut off the excess lead length. Do not solder.

( ) Locate the two hash filter chokes (#45-20). Observe that one of the leads comes through a slot and the other lead comes through a hole on the choke body. Cut the lead protruding from the hole of each choke to 1" in length. Slip a 3/4" length of sleeving over each 1" lead.

( ) Check the shaft on control MC and switch PA to make sure it is pushed in. Now place a #10 flat fiber washer over protruding screw J on the power supply shield plate. Cock the screw at an angle and slip a choke over the screw with the 1" lead next to the shield plate. See Detail 6A. Place another #10 flat fiber washer over the screw and secure the choke with a #6 lockwasher under a 6-32 nut. The choke will cock up slightly due to the buffer capacitor, but upon tightening the nut, the choke container will give slightly, holding the buffer capacitor rigidly in place. Be sure the choke is positioned with its leads oriented as shown in Pictorial 6. Do not overtighten.



Detail 6A

( ) Place a #6 lockwasher over the other 6-32 x 1-1/4" length screw. Then place a 3-lug miniature terminal strip on the screw, another #6 lockwasher, and insert the screw through hole K on the power supply shield plate. Now mount the other hash filter choke on the protruding screw in the same manner as in the preceding step. Use #10 fiber washers, #6 lockwasher, and a 6-32 nut. Orient the choke leads as shown.

( ) Connect the 1" lead from hash filter choke J to FT-10 (S-1). Do not crimp the lead.

( ) Connect the 1" lead from hash filter choke K to FT-9 (S-1). Do not crimp the lead.

( ) C60-A, B, C, and D. Locate the 4-section electrolytic filter capacitor (#25-110) and clip the top off of each of the four center lugs. See the insert on Pictorial 6. Now mount it on the metal wafer, from the top of the chassis, at location AD. Orient the capacitor with the ■ and ▲ marked lugs nearest the rear apron of the chassis. Twist the four tabs approximately one-quarter turn to secure the can to the wafer.

( ) Observe that one of the tabs on the filter capacitor does not have a hole in it. Solder this tab to the mounting wafer.

( ) Solder the tab located between the unmarked lug and the ▲ lug to the mounting wafer.

( ) Connect a bare wire between lug 3 of terminal strip DD (NS) and the tab located between the unmarked lug and the ▲ marked lug (S-1).

( ) Connect the black wire coming from FT-6 to the ▲ marked lug of filter capacitor AD (S-1).

( ) Connect the red wire coming from FT-7 to the unmarked lug of filter capacitor AD (NS).

( ) Connect the white wire coming from FT-8 to lug 4 of terminal strip DD (NS).

( ) Cut a white hookup wire to 3" and strip both ends 3/8". Connect one end to the ■ marked lug of filter capacitor AD (S-1). Connect the other end to lug 4 of terminal strip DD (NS).

( ) Cut a white hookup wire to 1-1/2" and strip both ends 3/8". Connect one end to lug 4 of terminal strip DD (NS). Connect the other end to lug 2 of terminal strip DD (NS).

( ) R34. Cut both leads of a 75 Ω, 5 watt resistor to 1" in length. Slip a 3/4" length of sleeving over each lead and form the leads at right angles close to the resistor body. Place the body of the resistor on the chassis between filter capacitor AD and vibrator socket AE. Connect one lead to the unmarked lug of filter capacitor AD (S-2). Connect the other lead to the ▲ marked lug of the filter capacitor AD (NS).

( ) Connect the red-blue power transformer lead from chassis hole G to the ▲ marked lug of filter capacitor AD (S-2).

Connect the power transformer leads from chassis hole H as follows:

( ) Short red lead to lug 1 of terminal strip DD (NS).

( ) Long red lead to lug 5 of terminal strip DD (NS).

( ) Blue lead to lug 1 of vibrator socket AE (NS). Bend ground lug GL-1 adjacent to this pin toward the chassis.

( ) Orange-black lead to lug 2 of vibrator socket AE (NS).

( ) Green lead to lug 5 of vibrator socket AE (NS). Bend ground lug GL-3 adjacent to this pin toward the 5 watt resistor.

( ) Yellow lead to lug 6 of vibrator socket AE (NS). Bend ground lug GL-4 adjacent to this pin toward the chassis.

( ) Black lead to FT-13 (S-1).

NOTE: The polarity of the next four components is very important. If not properly installed, damage to them or other components is likely. Follow the instructions closely to avoid any possible error.

( ) Locate the four large silicon rectifiers (#57-27). The positive (+) cathode end of the rectifiers will be marked with yellow and/or with the sign —▶|, with the arrow pointing toward the cathode end.

IMPORTANT: When soldering silicon rectifiers (or diodes) hold the lead with a pair of pliers between the body of the rectifier and the junction to be soldered to prevent heat reaching the rectifier body.

( ) CR-2. Cut both leads of a rectifier to 1/2" in length. Connect the cathode lead (+ or end marked yellow) to lug 2 of terminal strip DD (S-2). Connect the other lead to lug 1 of terminal strip DD (NS). Dress the rectifier as shown.

( ) CR-4. Cut both leads of a second rectifier to 1/2" in length. Connect the cathode lead to lug 4 of terminal strip DD (S-4). Connect the other lead to lug 5 of terminal strip DD (NS).

( ) CR-1. Cut both leads of a third rectifier to 3/4" in length. Dressing as shown, connect the cathode lead to lug 1 of terminal strip DD (S-4). Connect the other lead to lug 3 of terminal strip DD (NS).

( ) CR-3. Cut both leads of the remaining rectifier to 3/4" in length. Connect the cathode lead to lug 5 of terminal strip DD (S-4). Connect the other lead to lug 3 of terminal strip DD (S-3).

( ) Cut each lead of six .02 μfd disc ceramic capacitors to 1/2" in length. These capacitors will be connected to vibrator socket AE. Position the capacitors exactly as shown. Allow clearance for the left-hand partition plate and a phenolic shaft which will be installed on control MC at a later time.

( ) C55. Connect one of the six prepared capacitors between lug 1 (S-2) and ground lug GL-1 (NS).

( ) C54. Connect a second capacitor between lug 2 (S-2) and ground lug GL-1 (S-2).

( ) C53. Connect a third capacitor between lug 3 (NS) and ground lug GL-2 (NS).

( ) C58. Connect a fourth capacitor between lug 4 (NS) and ground lug GL-2 (S-2).

( ) C57. Connect a fifth capacitor between lug 5 (S-2) and lug 7 (NS). Dress the capacitor flat across the socket as shown.

( ) C56. Connect the remaining prepared capacitor between lug 6 (S-2) and lug 7 (NS).

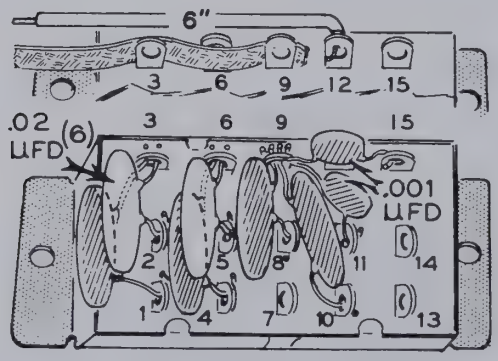
( ) Connect a bare wire between lug 7 (S-3) and ground lug GL-4 (NS).

Check for possible shorts and make sure there is plenty of clearance between lugs 1, 3, and 5 and the adjacent ground lugs.

POWER CONNECTOR PLUG WIRING

Refer to Detail 6B for the following steps.

( ) Locate the 15 pin power connector plug (male #432-34) and orient it as shown in Detail 6B.



Detail 6B

( ) Cut each lead of three .02 μfd disc ceramic capacitors to 3/8" in length. These capacitors will connect to the power connector plug. Position the capacitors as shown.

( ) C46. Connect one of the prepared capacitors between pin 2 (NS) and pin 3 (NS).

( ) C48. Connect a second capacitor between pin 5 (NS) and pin 6 (NS).

( ) C49. Connect the third capacitor between pin 8 (NS) and pin 9 (NS).

( ) Cut each lead of three more .02 μfd disc ceramic capacitors to 1/2" in length and connect as follows:

  ( ) C45. Connect a capacitor between pin 1 (NS) and pin 3 (NS).

  ( ) C47. Connect a second capacitor between pin 4 (NS) and pin 6 (NS).

  ( ) C50. Connect the third capacitor between pin 10 (NS) and pin 9 (NS).

( ) Locate the two .001 μfd disc ceramic capacitors with the letter "U" stamped on the body of the capacitor.

  ( ) C51. Cut both leads of one capacitor to 3/8" in length. Connect the capacitor between pin 11 (NS) and pin 9 (NS).

  ( ) C52. Cut both leads of the other capacitor to 1/2" in length. Connect the capacitor between pin 15 (NS) and pin 9 (NS).

( ) Cut a 2" length of tinned braided wire. Refer to Detail 6B and connect the braid to pins 3, 6, and 9 by weaving the braid over pin 3, under pin 6, and back over pin 9, with a 1-1/4" length of braid extending out from pin 3. Solder all three pins.

( ) Cut a stranded black hookup wire to 6" in length. Strip one end 1/8" and strip the other end 3/8". Tin lightly. Connect the 1/8" stripped end to pin 12 by just inserting the wire in the pin hole (S-1). Dress the wire along with the braid.

( ) Feed the orange transformer lead coming from chassis hole G out through the large rectangular hole. Trim the 3/8" stripped end to 1/8". Connect this lead to pin 5, dressing the lead between pins 2 and 3 (S-2). See Detail 6C.

( ) Now install the power connector in the rectangular cutout on the outside of the rear apron of the chassis, feeding the braid and stranded black wire through the cutout. Dress the orange lead down on the chassis and under the connector when in position. Mount with pins 3, 6, 9, 12, and 15 nearest the chassis. Install a connector lock (#260-32) at each mounting flange of the connector. Use 6-32 x 1/4" hardware. Position the locks as shown in Detail 6C.

( ) Connect the free end of the braid to ground lug GL-4 of vibrator socket AE (S-2). Dress the lead so that there is plenty of clearance between it and lug 6 of the vibrator socket.

( ) Connect the stranded black wire coming from pin 12 of the connector to lug 3 of vibrator AE (S-2).

( ) Locate the unstripped stranded black wire coming from FT-12 and strip to 1/8". Connect this wire to pin 15 on the connector (S-2).

( ) Connect the black transformer lead coming from chassis hole G to pin 11 on the connector (S-2).

( ) Connect the remaining black wire from FT-11 to pin 14 on the connector (S-1).

( ) Connect the yellow-blue lead to pins 13 and 10 of the connector by inserting the lead through both pins. Solder both connections.

( ) In a like manner, connect the green-black lead to pins 7 and 4 of the connector. Solder both connections.

( ) Slip a 1-5/8" length of sleeving over the lead coming from hash filter choke K. Form a right angle bend 1/8" long at the end of the lead and connect at pin 8 of the connector (S-2).

( ) RFC-6. Locate the 7 μh RF choke (#45-36, red dot) and cut one lead to 3/8" in length. Cut the other lead to 3/4" in length and slip a 1/2" length of sleeving over this lead. Connect the 3/4" lead to lug 4 of vibrator socket AE (S-2). Connect the other lead to pin 2 of the connector (S-2). Position the choke as shown.

( ) Slip a 1-5/8" length of sleeving over the lead coming from hash filter choke J and connect this lead to pin 1 of the connector (S-2).

This completes all wiring of the power supply section. Check to make sure all connections have been soldered. Look for possible shorts on the connector and vibrator socket, solder drops, and wire clippings laying on the filter capacitor. Be sure there is clearance between lug 4 of terminal strip DD and the hash filter choke leads.

( ) Use a pencil to mark the shaft of control MC (shaft pushed in) at the bushing. Now push the shaft out.

( ) Locate a shaft coupling (#456-7) and start two 6-32 x 1/8" setscrews in the tapped holes. Place the coupling on the shaft of control MC until the edge of the coupling lines up with the pencil mark, then tighten the setscrew. Push the shaft in and out checking switch PA for complete travel.

( ) Locate the 3-1/16" phenolic shaft, insert it through the hole on the rear apron of the chassis marked MOD LEVEL, and into the coupling. Tighten the other setscrew.

WIRING OF THE MODULATOR SECTION

Refer to Pictorial 7 for the following steps.

( ) Turn the chassis around to its reference position.

( ) Locate the red wire connected to lug 5 of switch PA and connect the free end to lug 3 of terminal strip EE (NS).

( ) Connect the green driver transformer lead nearest lug 5 of tube socket V11 to lug 5 (S-1).

( ) Connect the green-black driver transformer lead to ground lug 4 of tube socket V11 (S-1).

( ) Connect the other green driver transformer lead to lug 1 of tube socket V11 (S-1).

( ) Connect the blue driver transformer lead to lug 1 of tube socket V10 (NS).

( ) Connect the red driver transformer lead to lug 2 of terminal strip FF (NS). Dress the lead under terminal strip HH as shown.

( ) Connect the yellow-brown modulation transformer lead coming from grommet hole B to lug 4 on DPDT switch PA (NS). Dress the lead as shown.

( ) Connect the longest blue modulation transformer lead coming from grommet C to lug 6 of tube socket V11 (S-1). Dress the lead near the chassis and around the tube socket as shown.

( ) Connect the other blue modulation transformer lead to lug 3 of tube socket V11 (S-1).

( ) Connect the red modulation transformer lead to lug 6 of terminal strip GG (NS).

( ) Locate the 7" length of black stranded wire connected to FT-9 (not stripped) and strip the end 3/8". Tin lightly and connect it to lug 7 of tube socket V11 (NS). Dress the lead as shown.

( ) Locate the 6-1/2" length of black stranded wire connected to FT-10 and connect it to lower hole lug 2 of tube socket V11 (NS).

( ) Dress the other three black wires out through the rectangular cutout in the front apron of the chassis.

( ) Cut a white hookup wire to 4-1/4". Strip both ends 3/8". Connect one end to lug 3 of tube socket V10 (S-1). Dress the wire under terminal strip HH as shown and connect the other end to lug 3 of terminal strip FF (NS).

( ) Cut both a black and a white wire to 6". Strip both ends of each wire 3/8". Referring to Detail 7A, twist the two wires together.

TWISTED LEAD PREPARATION

Detail 7A

( ) Dress the twisted pair between driver transformer T-2 and the front apron of the chassis. Connect one end of the black wire to lug 9 of tube socket V10 (S-1). Connect the white wire to lugs 4 and 5 of tube socket V10. Solder both lugs.

( ) At the other end of the twisted pair, connect the black wire to lug 7 of tube socket V11 (NS). Connect the white wire to lug 2 of tube socket V11 (NS).

( ) Cut a white wire to 3" and strip both ends 3/8". Connect one end to lug 8 of tube socket V10 (NS). Connect the other end to lug 1 of terminal strip FF (NS).

( ) R42. Cut both leads of a 1.5 KΩ (brown-green-red) 1/2 watt resistor to 1/2" in length. Connect one lead to lug 8 of tube socket V10 (S-2). Connect the other lead to the solder lug near lugs 4 and 5 (NS).

( ) R41. Cut both leads of a 2.2 megohm (red-red-green) 1/2 watt resistor to 3/8" in length. Connect one lead to lug 7 of V10 (NS). Connect the other lead to the solder lug (NS).

( ) C61. Cut both leads of a 100 $\mu\mu$f disc ceramic capacitor to 1/2" in length. Connect one lead to lug 7 of V10 (NS). Connect the other lead to the solder lug (S-3).

( ) RFC-13. Locate an 11 μh RF choke (#45-31) and cut one lead to 7/8" in length. Insert the choke through grommet D, positioning the choke body in the grommet, and connect the 7/8" lead to lug 7 of V10 (S-3). Bend the other lead parallel to the front apron toward grommet E.

( ) R43. Cut one lead of a 100 KΩ 1/2 watt (brown-black-yellow) resistor to 1/2" in length. Bend the 1/2" lead at a right angle to the resistor body and connect it to lug 6 of V10 (NS). The other lead is not connected at this time.

( ) C64. Cut both leads of a .001 μfd disc ceramic capacitor to 3/4". Slip a 1/2" length of sleeving over one of the leads and connect this lead to lug 6 of V10 (S-2). Connect the other lead to lug 1 of terminal strip HH (NS).

( ) R51. Cut one lead of a 470 KΩ (yellow-violet-yellow) 1/2 watt resistor to 3/8". Cut the other lead to 3/4". Connect the shorter lead to lug 2 of V10 (NS). Slip a 1/2" length of sleeving over the other lead and connect to lug 5 of terminal strip HH (NS).

( ) C72. Cut both leads of the .01 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 1 of V10 (S-2). Connect the other lead to lug 4 of terminal strip HH (NS).

( ) C66. Cut both leads of a .02 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 2 of V10 (S-2). Connect the other lead to lug 2 of terminal strip HH (NS).

( ) R58. Cut one lead of the 110 Ω 5 watt resistor to 3/4" and the other lead to 1-1/4". Place the resistor on the chassis next to terminal strip GG as shown. Slip a 1/2" length of sleeving over the shorter lead and connect it to lug 5 of terminal strip GG (NS). The other lead will be connected later.

( ) R40. Cut both leads of the remaining 75 Ω 5 watt resistor to 3/4" in length. Place the resistor next to terminal strip JJ. Connect one lead to lug 2 of terminal strip JJ (NS). Connect the other lead to lug 6 of terminal strip GG (NS).

CABLE ASSEMBLY INSTALLATION

( ) Locate the cable assembly, and study Detail 7B, and Pictorial 8 on Page 42. Straighten the cable assembly out with the breakouts, BO#1 and BO#2, to your left. Dress all the breakout leads exactly as shown in Detail 7B.

( ) Referring to Detail 7B, smooth BO#8 through BO#12 toward the main trunk.

( ) Now form the cable assembly at right angles, bending the cable halfway between BO#7 and BO#8.

Refer to Pictorial 8 for the following steps.

( ) Place the cable assembly on the chassis with BO#6 and BO#7 located under relay RL-1. BO#1 through BO#5 should be to the left side of the chassis, and BO#8 through BO#13 should be to the right side of the chassis. The cable assembly trunk with BO#14 through BO#20 should be toward the front apron of the chassis.

( ) Dress the cable assembly trunk with BO#1 toward the rear apron of the chassis between the power supply shield plate and the switch bracket, then toward the left, dressing the cable in the bend of the chassis, and back toward the front feeding BO#1 through grommet A. Allow clearance along the side for sheet metal screws that will protrude into the chassis compartment at a later time.

( ) Feed BO#18, BO#19, and BO#20 out through grommet E on the front apron of the chassis.

( ) Feed the six long leads from BO#14 through grommet C. The two short white leads and blue lead remain in the bottom of the chassis.

( ) Feed the two brown, one violet, and the longer black leads from BO#16 through grommet B. Dress the cable between terminal strips GG and HH and against the chassis. Dress between tube socket V11 and the 5 watt 110 Ω resistor, then dress against terminal strip GG as shown. It is important that the cable be kept away from lugs 1 and 2 of terminal strip HH.

( ) Connect the two white leads from BO#14 to lug 2 of tube socket V11 (NS).

( ) Connect the blue lead from BO#14 to lug 6 of terminal strip GG (NS).

( ) Connect the free lead of the 5 watt 110 Ω resistor to lug 8 of tube socket V11 (NS).

( ) Connect the gray lead from BO#15 to lug 5 of terminal strip GG (NS).

( ) Connect the brown lead from BO#15 to lug 5 of terminal strip HH (NS).

( ) Connect the short black lead from BO#16 to lug 1 of terminal strip GG (NS).

Refer to Pictorial 9 (fold-out from Page 45) for the following steps.

( ) Locate the marked audio cable connected to lug 3 of control MC. Connect the center conductor to lug 1 of terminal strip HH (S-2). Slip a 1/2" length of sleeving over the outer shield and connect it to lug 3 of terminal strip HH (NS).

( ) Connect the center conductor of the other audio cable to lug 2 of terminal strip GG (NS). Connect the outer shield to lug 3 of terminal strip HH (NS).

( ) Slip a 1" length of sleeving over the free lead of the 100 KΩ 1/2 watt resistor connected to lug 6 of tube socket V10. Connect the lead to lug 1 of terminal strip GG (NS).

Connect the leads from BO#7 as follows:

( ) Connect the two orange leads to lug 2 of terminal strip JJ (S-3). Dress the leads back along the cable as shown.

( ) Connect the yellow and blue leads to lug 4 of switch PA (S-3).

( ) Connect the brown lead to lug 3 of switch PA (S-1).

( ) Connect the black lead to lug 17 of relay RL-1 (S-1).

( ) Connect the red lead to lug 16 of relay RL-1 (NS).

Connect the leads from BO#6 as follows:

( ) Connect the orange lead to FT-6 (NS).

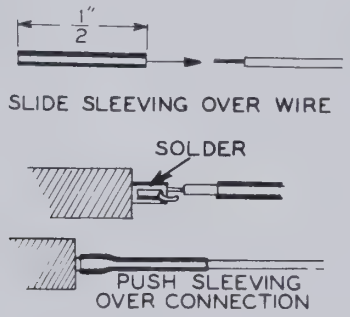
( ) Connect the three yellow leads to lug 1 of terminal strip EE (NS).

RELAY CONTACT WIRING

A 1/2" length of sleeving will be used on all leads, except for one, connected to the relay contacts. After the connection has been soldered, the sleeving will be slipped over the relay lug

to prevent any possible short circuits. Consequently, only a sufficient amount of solder should be used to make the necessary connections.

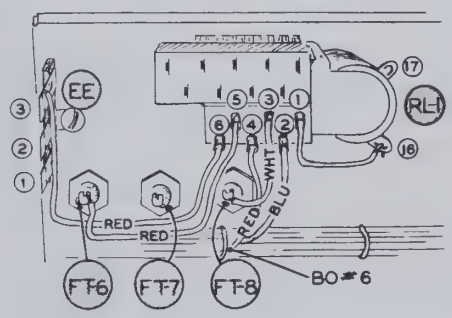
Refer to Detail 9A, Detail 9B, Detail 9C, and Pictorial 9 for the following steps.



Detail 9C

( ) Slip a 1/2" length of sleeving on each of the remaining seven leads of BO#6.

( ) Connect the blue lead from BO#6 to lug 2 of RL-1 (S-1). See Detail 9A.



Detail 9A

( ) Connect the red lead from BO#6 to lug 4 of RL-1 (S-1).

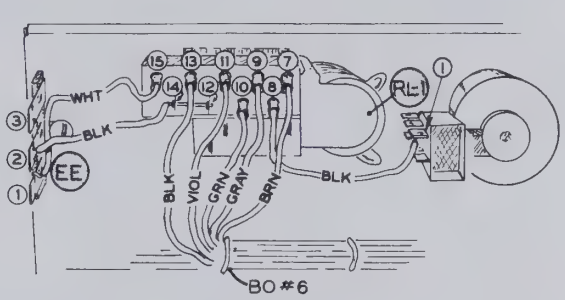
( ) Cut a red hookup wire to 2-1/4" and strip both ends 3/8". Slip a 1/2" length of sleeving over the wire and connect one end to lug 6 of RL-1 (S-1). Dress the wire as shown and connect the other end to lug 3 of terminal strip EE (NS).

( ) Cut a red hookup wire to 1-3/4" and strip both ends 3/8". Slip a 1/2" length of sleeving over the wire and connect one end to lug 1 of RL-1 (S-1). Connect the other end to lug 16 of RL-1 (S-3).

( ) Locate the white wire connected to FT-8. Slip a 1/2" length of sleeving over the free end and connect it to lug 3 of RL-1 (S-1).

( ) Cut a red hookup wire to 3" and strip both ends 3/8". Slip a 1/2" length of sleeving over the wire and connect one end to lug 5 of RL-1 (S-1). Dress the wire as shown and connect the other end to FT-6 (NS).

( ) Referring to Detail 9B, cut a black hookup wire to 2" and strip both ends 3/8". Slip a 1/2" length of sleeving over the wire and connect one end to lug 8 of RL-1 (S-1). Connect the other end to lug 1 of switch PA (S-1).



Detail 9B

( ) Connect the green lead from BO#6 to lug 10 of RL-1 (S-1).

( ) Cut a black hookup wire to 2" and strip only one end 1/4". Strip the other end 3/8". Insert the 1/4" stripped end through lugs 12 and 14 of RL-1. Solder both lugs. Connect the other end to lug 2 of terminal strip EE (S-1).

( ) Connect the brown lead from BO#6 to lug 7 of RL-1 (S-1).

( ) Connect the gray lead from BO#6 to lug 9 of RL-1 (S-1).

( ) Connect the violet lead from BO#6 to lug 11 of RL-1 (S-1).

( ) Connect the black lead from BO#6 to lug 13 of RL-1 (S-1).

( ) Cut a white hookup wire to 3-1/4" and strip both ends 3/8". Slip a 1/2" length of sleeving over the wire and connect one end to lug 15 of RL-1 (S-1). Connect the other end to lug 1 of terminal strip EE (NS).

This completes wiring of the relay contacts. Recheck the work. Make certain no shorts exist and that all wires are connected to the proper lugs.

Refer to Pictorial 9 for the following steps.

( ) R57. Cut both leads of a 10 KΩ (brown-black-orange) 1/2 watt resistor to 1". Slip a 3/4" length of sleeving over each lead. Connect one lead to FT-6 (S-3). Connect the other lead to lug 2 of terminal strip FF (NS). Dress the resistor as shown.

( ) R52. Cut both leads of a 1 KΩ 1/2 watt (brown-black-red) resistor to 3/4". Connect one lead to lug 1 of terminal strip EE (S-5). Connect the other lead to lug 3 of terminal strip FF (NS).

( ) R48. Cut both leads of a 470 KΩ (yellow-violet-yellow) 1/2 watt resistor to 1/2". Connect one lead to lug 2 of terminal strip HH (NS). Connect the other lead to lug 2 of terminal strip GG (S-2).

( ) R56. Cut both leads of a 56 KΩ (green-blue-orange) 1/2 watt resistor to 1/2". Bend both leads to right angles at the resistor body and connect one end to lug 3 of terminal strip HH (S-3). Connect the other lead to lug 4 of terminal strip HH (S-2).

( ) R50. Cut both leads of a 270 KΩ (red-violet-yellow) 1/2 watt resistor to 1/2". Connect one lead to lug 2 of terminal strip HH (S-3). Connect the other lead to lug 3 of terminal strip GG (NS).

( ) C67. Cut both leads of a .02 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 5 of terminal strip HH (S-3). Connect the other lead to lug 4 of terminal strip GG (NS).

( ) R60. Cut both leads of a 33 KΩ (orange-orange-orange) 1/2 watt resistor to 1/2". Bend both leads at right angles to the resistor body. Connect one lead to lug 4 of terminal strip GG (NS). Connect the other lead to lug 5 of terminal strip GG (S-3). Position the resistor as shown.

( ) C63. Cut both leads of a 2 μfd, 50 volt electrolytic capacitor (#25-35) to 1". Connect the positive (+) lead to lug 1 of terminal strip FF (S-2). Connect the negative (-) lead to lug 1 of terminal strip JJ (NS). Place the capacitor on the chassis and next to terminal strip GG as shown.

( ) C71. Cut the positive (+) lead of another 2 μfd, 50 volt electrolytic capacitor to 1". Cut the negative (-) lead to 1-3/4". When installing this capacitor, position it under relay RL-1 as far as it will go and dress the leads as shown. Slip a 1-1/2" length of sleeving over the negative (-) lead and connect it to lug 1 of terminal strip JJ (NS). Connect the positive (+) lead to lug 3 of terminal strip FF (S-3).

( ) C65-A, B. Locate the dual 8-8 μfd, 475 volt electrolytic capacitor (#25-3) and cut the negative (-) lead to 1/2". Cut one of the positive (+) leads to 1" and the other lead to 3/4". Position the capacitor between the two 2 μfd capacitors previously installed, with the short positive (+) lead near lug 2 of terminal strip FF. Connect this lead to lug 2 of terminal strip FF (S-3). Slip a 3/4" length of sleeving over the other positive (+) lead and connect it to lug 1 of terminal strip GG (NS). Slip 3/8" of sleeving over the negative (-) lead and connect it to lug 1 of terminal strip JJ (NS).

( ) Cut both a black and a white hookup wire to 7". Strip both ends of each wire 3/8" and twist the two wires together.

( ) Dress the twisted pair along with the cable harness as shown and connect one end of the black wire to lug 7 of tube socket V11 (NS). Connect the white wire to lug 2 of V11 (NS). The other ends will be connected later.

( ) Cut both a black and a white wire to 15". Strip both ends of each wire 3/8" and twist the two wires together.

( ) Feed the twisted pair through grommet E and connect the black wire to lug 7 of tube socket V11 (S-4). Connect the white wire to lug 2 of V11 (S-6).

( ) C73. Cut both leads of the 50 μfd, 25 volt electrolytic capacitor (#25-85) to 3/4". Place the capacitor as shown and connect the positive (+) lead to lug 8 of tube socket V11 (S-2). Connect the negative (-) lead to lug 1 of terminal strip JJ (S-4).

( ) R59. Cut both leads of a 3.3 KΩ (orange-orange-red) 1 watt resistor to 1". Slip a 3/4" length of sleeving over one lead and connect this lead to lug 4 of tube socket V11 (S-1). Connect the other lead to lug 6 of terminal strip GG (S-4).

( ) Cut a shielded audio cable to 5" in length and prepare it as shown in Detail 2B on Page 33.

( ) Connect one end of the center conductor of the audio cable to lug 3 of terminal strip GG (S-2). Connect the outer braid to lug 4 of terminal strip GG (NS). Dress the cable out through the rectangular hole on the front apron of the chassis. The other end will be connected later.

This completes wiring of the modulator section. All connections should be soldered on tube sockets V10 and V11, terminal strips FF, HH, and JJ. Lug 3 on terminal strip EE and lugs 1 and 4 on terminal strip GG should not be soldered at this time. The brown and gray leads of BO#17 and a brown lead from the combination output modulation transformer are not connected at this time. Lug 6 on switch PA is not used. If any discrepancy exists, carefully recheck the wiring for an error.

NOTES ON RECEIVER SECTION

1. Because of the compactness of this kit, leads on resistors, capacitors, etc., should be just long enough to reach their terminating points.

2. Follow the Pictorials and Details very closely, positioning the components exactly as shown. Failure to do this may make it very difficult to install components later.

3. The leads should be crimped tight enough to the lugs to keep them in place without solder.

4. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, cover the leads with insulating sleeving even though the step may not call it out. Extra sleeving has been provided for this purpose.

RECEIVER SUBCHASSIS

Refer to Pictorial 10 for the following steps.

( ) Locate the receiver subchassis (#200-M281) and position it as shown in Pictorial 10.

( ) Mount five .001 μfd feed-through capacitors at locations FT-1 through FT-5. Install each from the inside of the subchassis, securing on the outside with the nuts supplied with these capacitors.

( ) Mount a 6-meter slug tuned coil (#40-342, red color band) at location L-3 using the hardware supplied with the coil. Place the lockwasher between the coil flange and the chassis. Orient the coil terminals as shown.

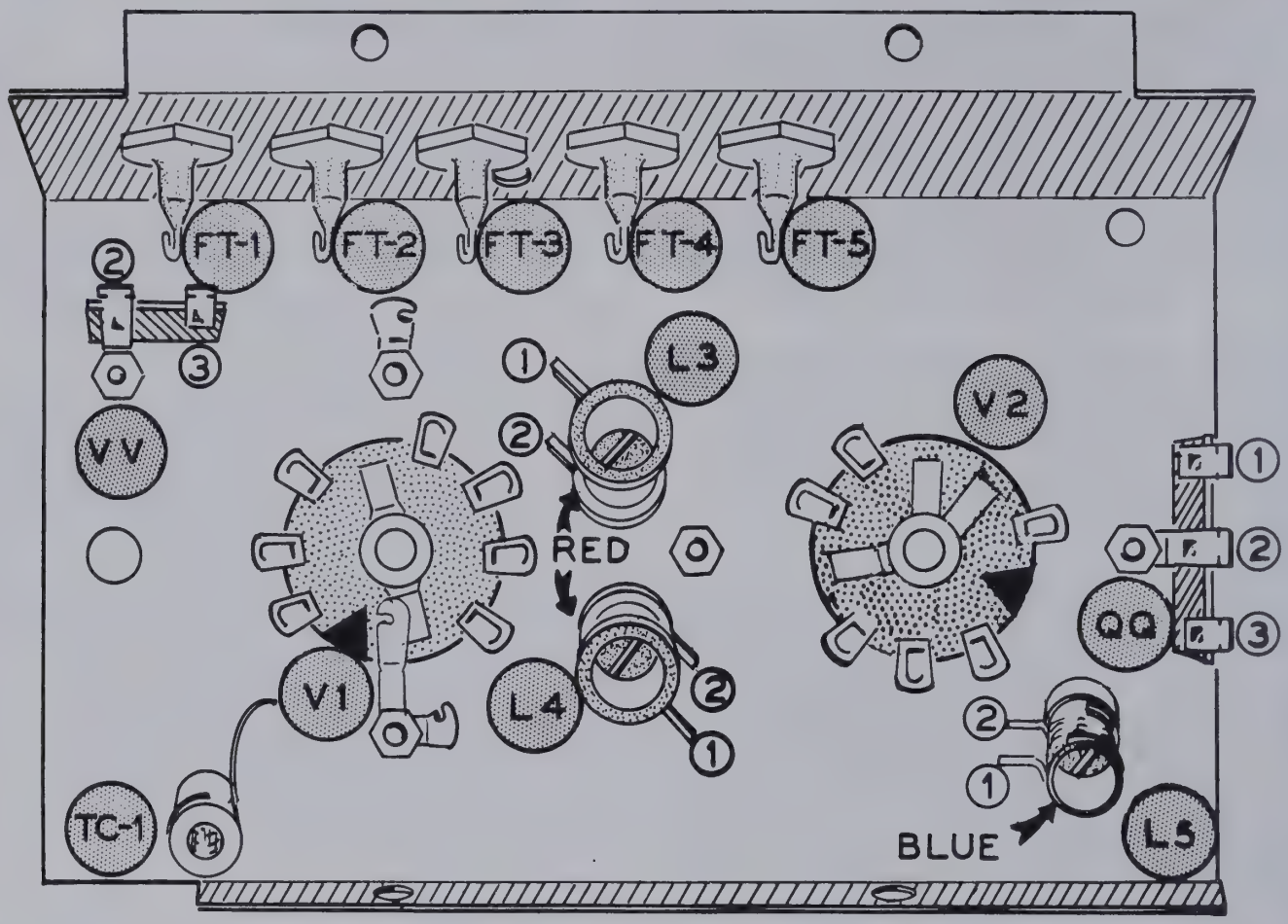
( ) Observe that there is a small retainer ring supplied with the coil. Install the ring as outlined in the next step.

( ) Referring to Detail 10A, lower the slug into the coil. Place the retainer ring into the groove as shown and snap it into position. Return the slug approximately to its original position.

Detail 10A

( ) In a like manner, mount the other 6-meter slug tuned coil (#40-342, red color band) at location L-4. Be sure to orient the coil terminals as shown.

( ) C2. Mount the 1.5-10 μμf tubular ceramic trimmer capacitor at TC-1. Refer back to Detail 1E on Page 29 for mounting procedure.



Pictorial 10

( ) Mount a 9-pin miniature shielded ceramic socket at location V1. Use 3-48 hardware. On the screw near lug 9, install two #6 small solder lugs, positioning them as shown. On the other mounting screw, install a single #6 small solder lug. Orient the socket with the wide pin spacing as shown.

( ) Mount the remaining 9-pin miniature shielded ceramic socket at location V2. Use 3-48 hardware. Mount a 3-lug miniature terminal strip on the mounting screw near lugs 1 and 9, using lockwashers under and above the terminal strip foot.

( ) Mount the crystal oscillator coil (#40-206, blue color band) at location L-5.

( ) Use a pair of diagonal cutters and cut off lug 1 of a 3-lug miniature terminal strip. Now install the terminal strip at location VV. Use 3-48 hardware.

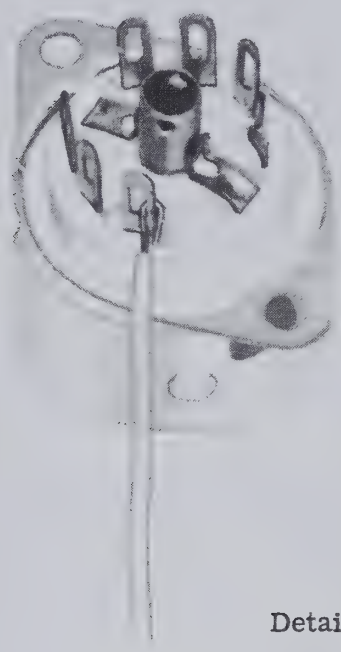
( ) Referring to Detail 10B, bend lugs 4 and 9 of tube socket V1 over to the center post. Now bend the solder lug adjacent to lug 9 over to the center post. Solder the two socket lugs and solder lug to the center post, but keep the holes at the top of the center post free of solder.

( ) Bend lugs 4, 7, and 8 of tube socket V2 over to the center post. Solder the three lugs to the center post, but keep the holes at the top of the center post free of solder.

RECEIVER SUBCHASSIS WIRING

Refer to Pictorial 11 for the following steps.

NOTE: It is quite helpful when connecting the leads of small components to first form a small hook at the lead end. Then place the hook over the lug or terminal, as the case may be, and squeeze the hook together. See Detail 11A.



Detail 10B

Detail 11A

( ) Cut a white hookup wire to 2-1/4" and strip both ends 3/8". Connect one end to lug 5 of tube socket V2 (NS). Connect the other end to lug 5 of tube socket V1 (NS).

( ) Cut a second white hookup wire to 2-1/4" and strip both ends 3/8". Connect one end to lug 5 of tube socket V1 (NS). Connect the other end to FT-3 (S-1). Dress the wire as shown.

( ) Cut a red hookup wire to 2-1/2" and strip both ends 3/8". Connect one end to terminal 2 of coil L3 (NS). Connect the other end to FT-4 (NS).

( ) C15. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 5 of tube socket V2 (S-2). Connect the other lead to the center post of V2 (NS).

( ) R6. Cut both leads of a 10 KΩ (brown-black-orange) 1/2 watt resistor to 1/2". Connect one lead to lug 1 of terminal strip QQ (NS). Connect the other lead to lug 2 of QQ (NS).

( ) C16. Cut both leads of a 100 μμf disc ceramic capacitor to 3/8". Connect one lead to lug 2 of terminal strip QQ (NS). Connect the other lead to lug 3 of QQ (NS).

( ) Connect a short bare wire from lug 9 of tube socket V2 (S-1) to lug 1 of terminal strip QQ (NS).

( ) Connect a short bare wire from the center post of tube socket V2 (NS) to lug 2 of terminal strip QQ (S-3).

( ) C18. Cut one lead of a 33 μμf disc ceramic capacitor to 3/4". Cut the other lead to 3/8". Connect the long lead to terminal 2 of coil L-5 (NS) by making a half turn wrap around the terminal and then connect the lead to lug 1 of tube socket V2 (S-1). Connect the other lead to terminal 1 of coil L-5 (NS).

( ) RFC-4. Cut one lead of an 11 μh RF choke (#45-31) to 1/2". Cut the other lead to 1". Bend both leads at right angles to the choke body, except in opposite directions. Slip a 3/4" length of sleeving over the longer lead and connect it to lug 6 of tube socket V2 (NS). Insert the other lead through the 1/8" hole on the side of the chassis. Position the body of the choke so it does not come in contact with the chassis.

( ) C11. Cut both leads of a 10 μμf disc ceramic capacitor to 3/8". Connect one lead to lug 6 of tube socket V2 (S-2). Connect the other lead to the center post of V2 (NS).

( ) Connect a short bare wire from lug 2 of tube socket V2 (NS) to terminal 2 of coil L-4 (S-1).

( ) C10. Cut both leads of a 2.2 μμf (red-red-white) tubular phenolic capacitor to 3/8". Connect one lead to lug 2 of tube socket V2 (S-2). Connect the other lead to terminal 2 of coil L-5 (S-3).

( ) R7. Cut one lead of a 100 KΩ (brown-black-yellow) 1/2 watt resistor to 5/8". Cut the other lead to 1". Connect the shorter lead to lug 3 of tube socket V2 (NS). Connect the other lead to FT-4 (S-2). Dress the resistor as shown.

( ) C19. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 3 of tube socket V2 (S-2). Connect the other lead to the center post of V2 (S-4).

( ) C17. Cut both leads of a .001 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 3 of terminal strip QQ (NS). Connect the other lead to terminal 1 of coil L-5 (NS).

( ) Locate the 28.000 mc crystal (#404-13) and cut both leads to 1/2". Connect one lead to lug 1 of terminal strip QQ (S-3). Connect the other lead to lug 3 of QQ (S-3). Do not overheat the crystal leads. Position the crystal up as shown.

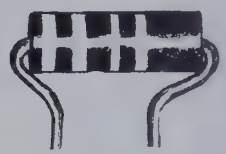
( ) RFC-3. Cut both leads of a 7 μh RF choke (#45-36, red color dot) to 3/4". Connect one lead to terminal 1 of coil L-5 (S-3). Connect the other lead to FT-5 (NS).

( ) C7. Cut both leads of a .001 μfd disc ceramic capacitor to 1/2". Connect one lead to the solder lug near lug 5 of tube socket V1 (S-1). Connect the other lead to terminal 2 of coil L-3 (NS).

( ) C8. Cut both leads of a 3.3 μμf disc ceramic capacitor to 3/8". Connect one lead to terminal 2 of coil L-3 (S-3). Connect the other lead to terminal 1 of coil L-3 (NS).

( ) Connect a short bare wire from lug 6 of the tube socket V1 (S-1) to terminal 1 of coil L-3 (S-2).

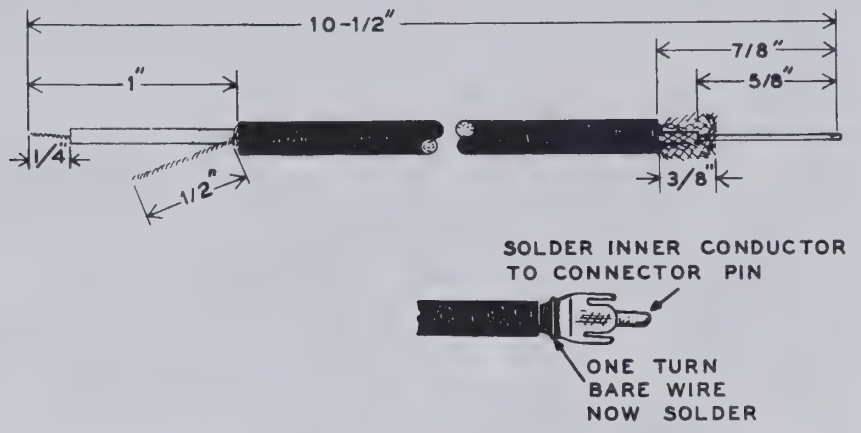
( ) R4. Cut both leads of a 470 KΩ (yellow-violet-yellow) 1/2 watt resistor to 3/8". Form the leads as shown in Detail 11B. Connect one lead to lug 8 of V1 (NS). Connect the other end to lug 7 (NS).



Detail 11B

( ) Cut both leads of the 5.55 Ω wire-wound resistor to 3/8". Connect one lead to lug 8 of tube socket V1 (S-2). Connect the other lead to lug 1 of V1 (S-1). Position as shown.

( ) C6. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 7 of tube socket V1 (S-2). Connect the other lead to the center post of V1 (NS).



Detail 11C

( ) C4. Cut both leads of another .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 5 of tube socket V1 (S-3). Connect the other lead to the center post of V1 (NS).

( ) C5. Cut both leads of a 470 μμf disc ceramic capacitor to 3/8". Connect one lead to lug 3 of tube socket V1 (NS). Connect the other lead to the center post of V1 (S-3).

( ) R2. Cut both leads of a 62 Ω (blue-red-black) 1/2 watt resistor to 1/2". Connect one lead to lug 3 of tube socket V1 (S-2). Connect the other lead to FT-2 (S-1).

( ) R1. Cut one lead of a 1 megohm (brown-black-green) 1/2 watt resistor to 1". Cut the other lead to 1/2". Connect the shorter lead to lug 2 of tube socket V1 (NS). Connect the other lead to FT-1 (S-1). Position the resistor as shown.

( ) Cut off the lead on the tubular ceramic trimmer capacitor TC-1.

( ) C3. Cut one lead of a 47 μμf disc ceramic capacitor to 1". Cut the other lead to 3/8". Connect the shorter lead to lug 2 of tube socket V1 (S-2). Connect the other lead to TC-1 by making a complete wrap around the trimmer capacitor (NS).

( ) Prepare a 10-1/2" length of coax cable (RG-58A/U) as shown in Detail 11C. Tin the center conductor at both ends.

( ) Install a phono connector on the 7/8" stripped end. Insert the center conductor in the phono connector and solder the tip. Then slip the braid over the connector cap and wrap a one turn loop of bare wire around the cap as shown. Solder the braid to the cap, but avoid using too much heat as damage to the inner insulation may result.

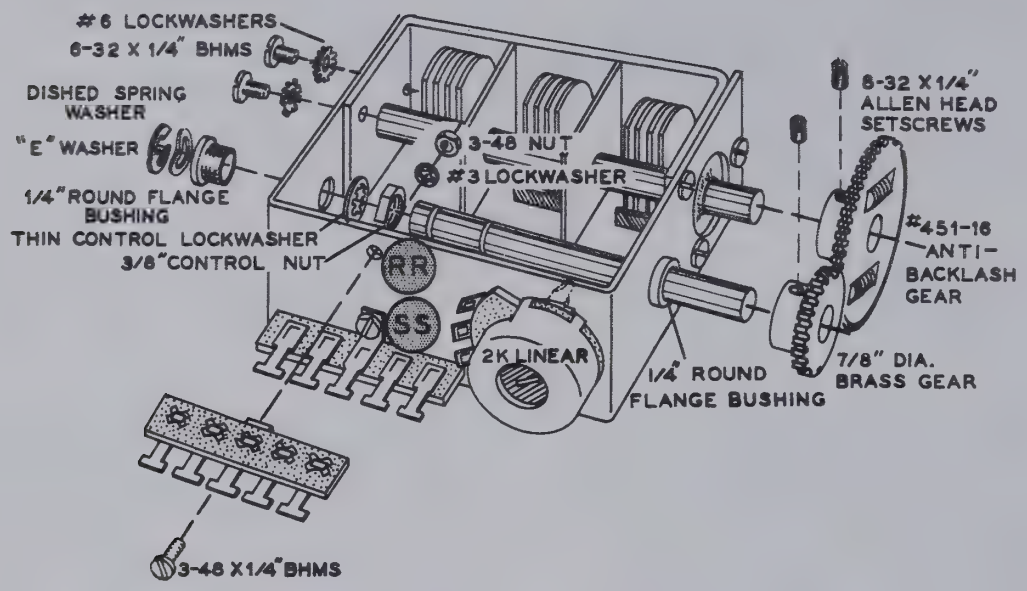
( ) Feed the other end of the coax cable through the 1/4" hole in the receiver subchassis from the side, as shown. Connect the center conductor to lug 3 of terminal strip VV (NS). Connect the braid to lug 2 of VV (NS).

( ) Locate the 6-meter RF input coil (#40-343). Study Pictorial 11 carefully and connect the coil lead near the tapped lead end of the coil to lug 2 of terminal strip VV (S-2). Connect the lead tapped to the coil, to lug 3 of VV (S-2). Connect the remaining coil lead to TC-1 (S-2). Position the coil as shown, making sure it does not extend above the subchassis flange.

( ) R5. Cut both leads of a 1 megohm (brown-black-green) 1/2 watt resistor to 3/8". Connect one lead to terminal 1 of coil L-4 (NS). Connect the other lead to the solder lug near lug 8 of tube socket V1 (NS).

( ) C9. Cut both leads of a 47 μμf disc ceramic capacitor to 1/2". Connect one lead to terminal 1 of coil L-4 (S-2). Connect the other lead to the solder lug near lug 8 of V1 (S-2).

This completes all wiring of the receiver subchassis. All connections should be soldered except FT-5 and the free lead on the 11 μh RF choke RFC-4. Check for any possible shorts such as socket lugs touching. Position all components as shown in the Pictorial. Now set the subchassis aside.



Pictorial 12

SHAFT SUPPORT BRACKET ASSEMBLY

Refer to Pictorial 12 for the following steps.

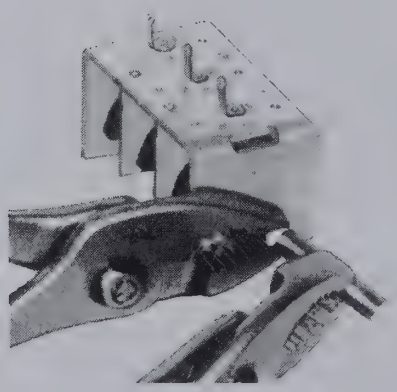
( ) Locate the shaft support bracket (#204-M341) and install 1/4" round flange bushings as shown in the 3/8" holes located on each end of the bracket. Use thin control lockwashers and 3/8" control nuts.

( ) R36. Locate the 2 KΩ linear (meter "Zero" adjust) control (#10-52) and mount it on top of the bracket, as shown. Use a pair of pliers and twist the control mounting tabs 90 degrees.

( ) Mount a 5-lug miniature terminal strip at location RR, using 3-48 x 1/4" hardware. Position as shown.

( ) In a like manner, mount the remaining 5-lug miniature terminal strip at location SS, using 3-48 x 1/4" hardware.

( ) C12-A, B, C. Locate a 3-gang variable tuning capacitor (#26-68) and keep the plates closed. Observe that there is a groove cut into the shaft. Referring to Detail 12A, grasp the shaft with pliers between the groove and the capacitor frame. With a second pair of pliers break the shaft off at the groove. Save the shaft as it will be used later.



Detail 12A

( ) Mount the shaft support bracket to the variable tuning capacitor by first placing the shaft end of the capacitor through the large hole in the bracket. Then spring the other end of the bracket slightly, to slip over the capacitor frame. Secure in place with six 6-32 x 1/4" screws, using #6 lockwashers under the screw heads.

( ) Locate an anti-backlash gear (#451-16) and start an 8-32 x 1/4" Allen setscrew into the gear hub.

( ) Place the gear over the capacitor shaft with the hub toward the frame. Align the flat side of the gear with the shaft end and tighten the Allen setscrew. Use the Allen wrench supplied with the kit.

( ) Locate a 3-5/8" shaft (#453-99) with the two "E" washer grooves at one end. Install an "E" washer in the groove located at the very end of the shaft.

( ) Slip a dished spring washer over the shaft and insert the shaft through the 1/4" bushings. See Pictorial 12.

( ) Locate a brass 7/8" diameter tuning drive gear and start an 8-32 x 1/8" Allen setscrew into the gear hub.

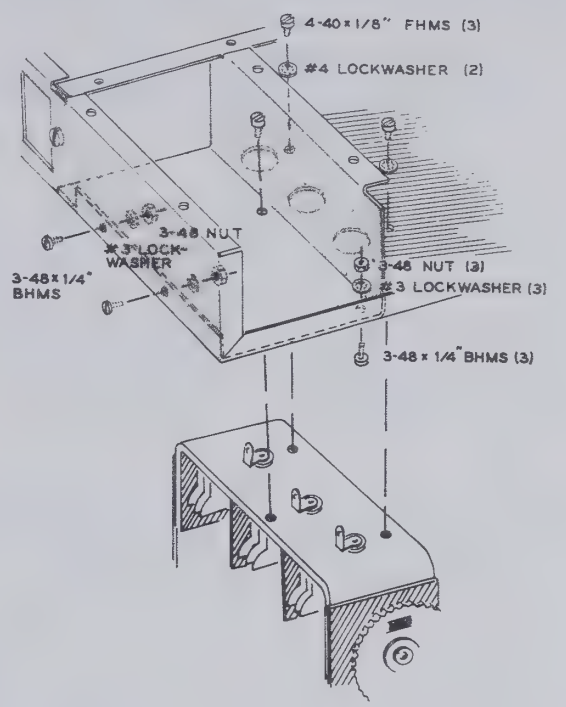
( ) Place the gear over the shaft just installed on the support bracket, with the hub toward the flange bushing. With the capacitor closed (plates meshed together), place tension on the anti-backlash gear by rotating the inside half of the gear past the other half for a distance of one tooth. Hold the tension with a screwdriver or with your fingers; slide the brass gear into place making sure the two gears mesh. Slightly compress the dished spring washer by pushing the shaft and, while holding the brass gear against the bushing, tighten the Allen setscrew.

( ) Rotate the shaft a few times making sure it turns freely. If some binding seems to exist, loosen the nuts on the 1/4" bushings, thus allowing the shaft to align itself, and retighten the nuts.

( ) Using a screwdriver, bend the three lugs on the bottom of the variable capacitor perpendicular to the frame. See Detail 12B. Take care not to break the ceramic insulation.

This completes assembly of the shaft support bracket. Set the assembly aside temporarily.

( ) Referring to both Detail 12B and Pictorial 13, mount the receiver subchassis on the main chassis in the large rectangular cutout.



Detail 12B

Use 3-48 x 1/4" hardware through the front apron of the main chassis. Do not tighten the nuts yet.

( ) Mount the variable 3-gang tuning capacitor with the shaft support bracket assembly on the top of the main chassis with the gear end near the outside edge of the chassis. The three lugs on the bottom of the variable capacitor protrude through the three large holes in the main chassis. Secure the assembly in place using three 4-40 x 1/8" Fillister head screws with #4 lockwashers under the two screwheads, toward the rear of the chassis. Observe that the three mounting holes of the capacitor are threaded. No nuts are used here. The center mounting hole is reached from inside the receiver subchassis by moving the 11 μh RF choke to one side. Use 3-48 x 1/4" hardware in the remaining hole on the receiver subchassis and main chassis. Now tighten all receiver subchassis mounting hardware. After the subchassis and capacitor are secured in place, return the RF choke to its original position.

Refer to Pictorial 13 (fold-out from Page 55) for the following steps.

( ) Cut both a black and a white wire to 5". Strip both ends of each wire 3/8" and twist the two wires together.

( ) Connect one end of the twisted pair to tube socket V4, the black wire to lug 3 (NS) and the white wire to lug 4 (NS). Dress the other end of the twisted pair as shown, over to tube socket V8 and connect the black wire to lug 3 (S-1). Connect the white wire to lug 4 (NS).

( ) Cut both a black and a white wire to 3-3/4". Strip both ends of each wire 3/8" and twist the two wires together.

( ) Connect one end of the twisted pair to tube socket V4, the black wire to lug 3 (NS) and the white wire to lug 4 (NS). Dress the twisted pair as shown, over to tube socket V5. Connect the black wire to lug 3 (S-1) and connect the white wire to lug 4 (NS).

( ) Cut both a black and a white wire to 4". Strip both ends of each wire 3/8" and twist the two wires together.

( ) Connect one end of the twisted pair to tube socket V4, the black wire to lug 3 (NS) and the white wire to lug 4 (NS). Dress the twisted pair as shown over to tube socket V3. Connect the black wire to lug 4 (S-1) and connect the white wire to lug 5 (S-1).

( ) Cut a white wire to 3-1/2" and strip both ends 3/8". Connect one end to lug 4 of tube socket V5 (S-2). Connect the other end to lug 4 of tube socket V6 (S-1).

( ) Cut a white wire to 3" and strip both ends 3/8". Connect one end to lug 4 of tube socket V8 (S-2). Connect the other end to lug 4 of V7 (S-1).

( ) Cut a red hookup wire to 3" and strip both ends 3/8". Connect one end to lug 1 of terminal strip PP (NS). Connect the other end to lug 5 of terminal strip NN (NS).

( ) Cut a red hookup wire to 3-3/8" and strip both ends 3/8". Connect one end to lug 5 of terminal strip NN (NS). Connect the other end to lug 4 of terminal strip LL (NS).

( ) Cut a white hookup wire to 3-3/4" and strip both ends 3/8". Connect one end to lug 4 of terminal strip NN (NS). Connect the other end to lug 5 of terminal strip LL (NS).

( ) Locate the partition plate with the grommet installed on it.

( ) Insert the cable assembly trunk containing BO#8 through BO#13 and the twisted pair from V11 through the grommet in the partition plate. Make sure the flanges on the partition plate are facing toward the right-hand side of the chassis.

( ) Push the partition plate into position, making sure that none of the wires in the modulator or power supply section are pinched between the partition plate and the main chassis. Dress the twisted pair of wires which run between V4 and V5 over the top of the spade bolt mounting hardware.

( ) Place a #6 lockwasher over each one of the protruding spade bolts (on the top side of the chassis) from the partition plate and secure in place with 6-32 nuts. Again make sure there are no wires being pinched.

( ) Fasten the ends of the partition plate to the front and rear aprons of the chassis with 6-32 x 1/4" hardware.

( ) Locate the twisted pair coming from the rubber grommet in the partition plate and dress it along the plate, over to tube socket V4. Connect the white wire to lug 4 (S-4). Connect the black wire to lug 3 (S-4). Double check the connections to these lugs, making sure <u>all</u> the wires are soldered and that there are no shorts between a black and white wire. If in doubt, spread each one of the wires away from each other. Use an ohmmeter to insure that there are no existing shorts.

( ) Insert a #6 sheet metal screw through the mounting foot of a 2-lug terminal strip (no ground lug). Place a #6 lockwasher over the protruding screw and install the terminal strip at location KK on the partition plate.

( ) Dress the cable assembly along the center of the partition plate toward the rear apron, then down along the bend on the chassis as shown.

NOTE: If the leads are too long from the break-outs, cut each to length.

( ) Connect the red lead from BO#13 to lug 1 of terminal strip PP (NS).

Connect the leads from BO#12 as follows:

( ) Gray lead to lug 2 of V7 (S-1).

( ) Yellow lead to lug 4 of IF-4 (NS).

( ) Green lead to lug 4 of terminal strip NN (NS).

( ) Dress the leads from BO#10 down on the chassis and over to terminal strip MM. Connect as follows:

( ) White lead to lug 3 of terminal strip MM (NS).

( ) Yellow lead to lug 1 of terminal strip MM (NS).

( ) Brown lead to lug 5 of tube socket V7 (NS).

( ) Orange lead to lug 6 of tube socket V7 (NS).

( ) Dress the blue and violet leads from BO#9 down against the chassis and over to terminal strip LL. Connect the leads from BO#9 as follows:

( ) Blue lead to lug 1 of terminal strip LL (NS).

( ) Violet lead to lug 2 of terminal strip LL (NS).

( ) Red lead to lug 1 of terminal strip KK (NS).

( ) Gray lead to lug 2 of terminal strip KK (NS).

( ) Dress the leads from BO#8 as shown and connect them to the feed-through capacitors on the receiver subchassis as follows:

( ) Two green leads to FT-1 (S-2).

( ) Two gray leads to FT-2 (S-2).

( ) White lead to FT-3 (S-1).

( ) Two red leads to FT-4 (S-2).

( ) Three violet leads to FT-5 (S-3).

( ) Now check under the holes in the flange to assure clearance for #6 sheet metal screws.

This completes the cable assembly connections at this time. The brown and gray leads from BO #13, the black lead from BO#12 and the brown lead from BO#11 will be connected later. Recheck the work, making sure the leads are dressed as shown and are connected to their proper points.

Refer to Pictorial 13 for the following steps.

( ) Slip a 3/8" length of sleeving over the 11 μh RF choke lead protruding through the 1/8" hole in the receiver subchassis. Connect this lead to lug 2 of the variable capacitor (NS).

NOTE: When #16 bare wire is used, do not try to crimp the wire around the lug. Instead, position the wire in the lug so that a good solder connection can be made.

( ) Connect the lead from tubular trimmer capacitor TC-3 to lug 2 of the variable capacitor (NS). Cut off any excess lead length.

( ) Cut a #16 bare wire to 1-1/8". Connect one end to lug 2 of the variable capacitor (S-3). Connect the other end to lug 4 of IF-1 (S-1).

( ) Cut a second #16 bare wire to 1-1/8". Connect one end to lug 3 of the variable capacitor (S-1). Connect the other end to lug 1 of IF-1 (NS).

( ) Slip a 3/4" length of sleeving over the lead from tubular trimmer capacitor TC-2. Connect this to lug 1 of IF-1 (S-2). Trim off excess lead length.

( ) Cut a #16 bare wire to 2". Connect one end to lug 1 of the variable capacitor (S-1). Run this wire around lug 2 of trimmer capacitor PC-4 and connect it to lug 2 of coil L-7 (S-1). Now solder lug 2 of PC-4 (S-2).

( ) Connect a short piece of #16 bare wire between lug 2 of V8 (S-1) and lug 4 of L-8 (S-1).

( ) Cut a black hookup wire to 1-3/4" and strip both ends 3/8". Connect one end to lug 2 of IF-1 (S-1). Connect the other end to the solder lug next to lug 4 of V3 (NS).

( ) Cut a small bare wire to 7/8". Connect one end to lug 1 of PC-4 (S-1). Connect the other end to the bottom of the ground lug located near lug 9 of V3 (NS).

NOTE: All resistors in this section are 1/2 watt unless otherwise specified and the bare wire used is small.

( ) R10. Cut both leads of the 22 KΩ (red-red-orange) resistor to 1/2". Bend the leads at right angles close to the resistor body. Connect one lead to lug 9 of V3 (NS). Connect the other lead to the solder lug near lugs 1 and 9 of V3 (NS). Dress the resistor down on the chassis as shown.

( ) Cut a small bare wire to 7/8". Connect one end to lug 9 of V3 (S-2). Connect the other end to lug 1 of L-7 (NS).

( ) RFC-5. Cut one lead of a 305 μh RF choke (#45-33) to 3/4". Cut the other lead to 1-1/2". Place a 1-1/4" length of sleeving over this lead and connect it to the ground lug near lugs 3 and 4 of V8 (S-1). Connect the other lead to lug 8 of tube socket V3 (NS).

( ) R11. Cut both leads of a 1 KΩ (brown-black-red) resistor to 1/2". Connect one lead to lug 7 of V3 (NS). Connect the other lead to the solder lug near lug 4 of V3 (NS). Slip the lead under the twisted pair as shown.

( ) R9. Cut both leads of a 1 megohm (brown-black-green) resistor to 3/8". Connect one lead to lug 2 of V3 (NS). Connect the other lead to the solder lug near lug 4 of V3 (NS).

( ) C21. Cut one lead of the 27 μμf disc ceramic capacitor to 3/8". Connect this lead to lug 2 of V3 (NS). Connect the other lead to TC-2, making a one turn wrap around the trimmer capacitor (S-1). One lead is already soldered in place. Clip off any excess lead.

( ) Cut a bare wire to 1-3/4" and connect one end to lug 3 of IF-2 (S-1). Slip a 1-3/8" length of sleeving over the bare wire and connect the other end to lug 6 of V3 (S-1). Dress the wire away from lug 2 of IF-2.

( ) Feed a short length of bare wire through lug 7 of V4 and connect it to the center post of V4 (S-1). Connect the other end to the solder lug near lug 7 of V4 (NS). Now solder lug 7 (S-2).

( ) Connect a short length of bare wire between lug 7 of V9 (S-1) and lug 2 of terminal strip MM (NS).

( ) Cut a red hookup wire to 1-1/2" and strip both ends 3/8". Connect one end to lug 1 of V9 (NS). Connect the other end to lug 2 of terminal strip LL (NS).

( ) Connect a short length of bare wire between lug 2 of L-8 (S-1) and the solder lug near lug 3 of V7 (NS).

( ) R20. Cut one lead of a 1 KΩ (brown-black-red) resistor to 3/4". Cut the other lead to 1/2". Connect the shorter lead to lug 6 of V5 (NS). Dress the resistor as shown and connect the longer lead to lug 5 of terminal strip NN (NS).

( ) R19. Cut both leads of a 33 Ω (orange-orange-black) resistor to 1/2". Connect one lead to lug 2 of V5 (NS). Connect the other lead to lug 3 of terminal strip NN (NS). Dress the resistor close to the chassis.

( ) Slip a short length of bare wire through lug 7 of V5 and connect it to the center post (S-1). Connect the other end to lug 3 of terminal strip NN (NS). Now solder lug 7 of V5 (S-2).

( ) R27. Cut both leads of the remaining 270 KΩ (red-violet-yellow) resistor to 1/2". Connect one lead to lug 7 of V6 (NS). Connect the other lead to lug 1 of terminal strip PP (NS).

Refer to Pictorial 14 for the following steps.

( ) C24. Cut both leads of a .005 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 1 of V3 (NS). Connect the other lead to the solder lug near lugs 1 and 9 of V3 (NS). Dress the capacitor up as shown.

( ) C14. Cut both leads of a second .005 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 3 of IF-1 (NS). Connect the other lead to the solder lug near lug 4 of V3 (NS).

( ) R8. Cut both leads of a 47 KΩ (yellow-violet-orange) resistor to 1/2". Connect one lead to lug 3 of IF-1 (S-2). Connect the other lead to lug 4 of terminal strip LL (NS).

( ) R13. Cut both leads of the remaining 470 KΩ (yellow-violet-yellow) resistor to 1/2". Bend one lead to a right angle and connect it to lug 3 of V3 (NS). Connect the other lead to lug 4 of terminal strip LL (NS).

( ) R12. Cut both leads of the remaining 10 KΩ (brown-black-orange) resistor to 5/8". Bend one lead at a right angle 1/4" from the end of the lead. Connect this end to lug 1 of V3 (S-2). Connect the other lead to lug 2 of terminal strip LL (S-3). Dress the resistor across the top of the tube socket as shown.

( ) C123. Cut both leads of a 100 μμf mica capacitor to 1/2". Connect one lead to lug 8 of V3 (NS). Connect the other lead to the solder lug between lugs 1 and 9 of V3 (S-4).

( ) C122. Cut both leads of a 50 μμf N750 (violet--green-black-black-green) tubular ceramic capacitor to 1/2". Connect one lead to lug 8 of V3 (NS). Connect the other lead to lug 1 of L-7 (NS).

( ) C121. Cut both leads of a 50 μμf mica capacitor to 1/2". Connect one lead to lug 8 of V3 (NS). Connect the other lead to lug 1 of L-7 (S-3).

( ) C22. Cut both leads of a .56 μμf (green-blue-gray) molded phenolic capacitor to 3/4". Bend the leads at right angles 1/2" from the ends. Connect one lead to lug 8 of V3 (S-5). Connect the other lead to lug 2 of V3 (S-3). Position the capacitor over the tube socket as shown.

( ) R15. Cut both leads of a 100 KΩ (brown-black-yellow) resistor to 3/8". Connect one lead to lug 2 of IF-2 (NS). Connect the other lead to lug 5 of terminal strip LL (NS).

( ) Bend lug 1 of IF-2 over toward lug 1 of V4. Now connect a short length of bare wire between lug 1 of IF-2 (S-1) and lug 1 of V4 (S-1).

( ) R14. Cut both leads of a 1 KΩ (brown-black-red) resistor to 5/8". Connect one lead to lug 4 of IF-2 (NS). Connect the other lead to lug 4 of terminal strip LL (NS).

( ) Connect a short length of bare wire between lug 5 of V4 (S-1) and lug 3 of IF-3 (S-1).

( ) Cut a bare wire to 1-1/2" and connect one end to lug 4 of IF-3 (NS). Slip a 1" length of sleeving over the bare wire and connect the other end to lug 6 of V4 (NS).

( ) R16. Cut both leads of the remaining 33 Ω (orange-orange-black) resistor to 3/8". Connect one lead to lug 2 of V4 (NS). Connect the other lead to lug 2 of terminal strip KK (NS).

( ) R18. Cut both leads of a 100 KΩ (brown-black-yellow) resistor to 1". Connect one lead to lug 2 of IF-3 (NS). Connect the other lead to lug 5 of terminal strip LL (NS).

( ) R30. Cut both leads of a 100 KΩ (brown-black-yellow) resistor to 3/8". Connect one lead to lug 7 of V8 (NS). Connect the other lead to lug 1 of terminal strip LL (NS).

( ) R25. Cut both leads of a 39 KΩ (orange-white-orange) resistor to 1/2". Connect one lead to lug 1 of V8 (NS). Connect the other lead to the solder lug near lugs 1 and 7 of V8 (NS).

( ) C39. Cut both leads of a 100 μμf mica capacitor to 3/8". Connect one lead to lug 1 of V8 (S-2). Connect the other lead to lug 1 of L-8 (S-1).

( ) Slip a bare wire through lug 3, then through the center post, and connect it to lug 7 of V7. Connect the other end to the solder lug near lug 3 of V7. Now solder lug 7 (S-1), center post (S-2) and lug 3 (S-2).

( ) R24. Cut both leads of a 1 megohm (brown-black-green) resistor to 5/8". Connect one lead to lug 3 of L-8 (S-1). Connect the other lead to lug 3 of terminal strip MM (NS).

( ) R54. Cut both leads of a 47 KΩ (yellow-violet-orange) resistor to 1/2". Connect one lead to lug 5 of V7 (NS). Dress the resistor as shown and connect the other lead to lug 1 of terminal strip MM (NS).

( ) R53. Cut both leads of a 100 KΩ (brown-black-yellow) resistor to 5/8". Connect one lead to lug 5 of terminal strip NN (NS). Connect the other lead to lug 1 of terminal strip MM (S-3).

( ) R17. Cut one lead of a 1 KΩ (brown-black-red) resistor to 3/8". Cut the other lead to 1/2". Connect the longer lead to lug 5 of terminal strip NN (S-5). Connect the 3/8" lead to lug 4 of IF-3 (S-2).

( ) Bend lug 1 of IF-3 over toward lug 1 of V5. Connect a short length of bare wire between lug 1 of IF-3 (S-1) and lug 1 of V5 (S-1).

( ) Cut a red hookup wire to 2" and strip both ends 3/8". Connect one end to lug 6 of V5 (S-2). Connect the other end to lug 4 of IF-4 (NS).

( ) Cut a bare wire to 1-1/4". Connect one end to lug 5 of V5 (S-1). Slip a 3/4" length of sleeving over the bare wire and connect the other end to lug 3 of IF-4 (S-1). Dress the wire away from lug 1 of terminal strip NN as shown.

( ) R23. Cut both leads of a 1 megohm (brown-black-green) resistor to 1/2". Connect one lead to lug 2 of IF-4 (NS). Connect the other lead to lug 4 of terminal strip NN (NS).

( ) R49. Cut both leads of the remaining 1 megohm (brown-black-green) resistor to 1/2". Connect one lead to lug 1 of V7 (NS). Connect the other lead to lug 4 of terminal strip NN (S-4).

( ) R22. Cut both leads of a 220 KΩ (red-red-yellow) resistor to 1/2". Connect one lead to lug 1 of terminal strip NN (NS). Connect the other lead to lug 3 of NN (NS). Dress the resistor down along the terminal strip as shown.

( ) R21. Cut both leads of the remaining 220 KΩ (red-red-yellow) resistor to 1/2". Connect one lead to lug 2 of IF-4 (NS). Connect the other lead to lug 1 of terminal strip NN (NS).

( ) C36. Cut both leads of a 100 μμf mica capacitor to 1/2". Connect one lead to lug 1 of terminal strip NN (NS). Connect the other end to lug 3 of NN (NS). Dress the capacitor straight up.

( ) C34. Cut both leads of a second 100 μμf mica capacitor to 1/2". Connect one lead to lug 3 of terminal strip NN (S-5). Connect the other lead to lug 2 of IF-4 (NS).

( ) SD-1. Locate a silicon diode (#56-5, red-red-blue) and cut both leads to 1/2". Connect the lead from the red-color-band end to lug 2 of IF-4 (S-4). CAUTION: Use a pair of pliers between the body of the diode and the connection to conduct the heat away. Connect the other lead to lug 5 of terminal strip PP (NS).

( ) R26. Cut both leads of a 2.2 megohm (red-red-green) resistor to 1/2". Connect one lead to lug 1 of V6 (NS). Connect the other lead to the solder lug near lug 3 of V6 (NS).

( ) Slip a short length of bare wire through the center post, then through lug 3 of V6 and connect it to the solder lug near lug 3 of V6. Connect the other end to lug 2 of V6. Now solder lug 2 (S-1), the center post (S-2), lug 3 (S-2), and the solder lug (S-2).

( ) Cut a bare wire to 1-1/2" and connect one end to lug 1 of IF-4 (NS). Slip a 3/4" length of sleeving over the bare wire and connect the other end to lug 6 of V6 (S-1).

( ) R28. Cut both leads of a 100 KΩ (brown-black-yellow) resistor to 1/2". Connect one lead to lug 2 of terminal strip PP (NS). Connect the other lead to lug 4 of PP (NS).

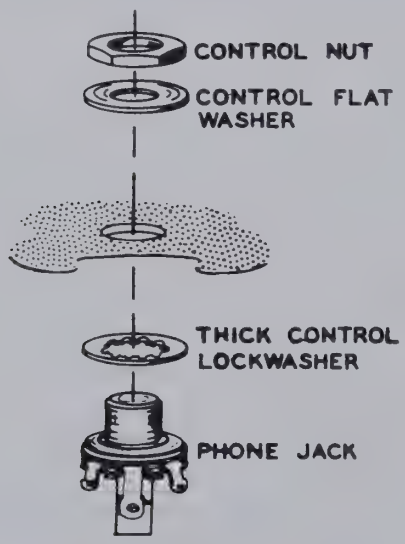
( ) Cut a bare wire to 1" and connect one end to lug 5 of V6 (S-1). Slip a 1/2" length of sleeving over the bare wire and connect the other end to lug 2 of terminal strip PP (NS).

( ) Recheck the work at this point, particularly around tube sockets V5 and V6. The installation of three parts on the rear apron in the next steps will make it somewhat difficult to check for errors in this area after they are mounted.

Refer to Pictorial 15 (fold-out from Page 61) for the following steps.

( ) C38. Cut both leads of a .02 μfd disc ceramic capacitor to 3/4". Connect one lead to lug 1 of terminal strip NN (S-4). Slip a 1/2" length of sleeving over the other lead and connect it to lug 1 of V6 (S-2).

( ) Locate a phone jack (#436-4) and mount it at the hole marked "PHONES" on the rear chassis apron. Use a thick control lockwasher, flat control washer, and secure with a control nut. See Detail 15A for mounting procedure, and position the jack as shown.



Detail 15A

( ) Locate the 3-lug slide switch with tapped mounting holes (#60-4) and mount it at the rectangular cutout on the rear apron of the chassis. Use 6-32 screws to secure the switch in place.

( ) Locate a phono socket and mount it at the remaining hole on the rear chassis apron, using 6-32 hardware.

( ) Connect the brown lead from BO#13 to the center lug of the phono socket (S-1).

( ) Connect the gray lead from BO#13 to lug 3 of the slide switch (S-1).

( ) Connect the black lead from BO#12 to lug 1 of the slide switch (S-1).

( ) Connect the brown lead from BO#11 to lug 2 of the phone jack (NS).

( ) Cut a bare wire to 1" and connect one end to lug 3 of the phone jack (S-1). Slip a 1/2" length of sleeving over the bare wire and connect the other end to lug 2 of the slide switch (S-1).

( ) C41. Cut both leads of the remaining .005 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 7 of V6 (NS). Connect the other lead to lug 1 of terminal strip PP (S-4).

( ) Select twenty .02 μfd disc ceramic capacitors and cut both leads of each capacitor to 1/2". These capacitors will be installed in the next twenty steps. Position them straight up as shown, using sleeving wherever a short could occur. Connect as follows:

  ( ) C30. One lead to lug 4 of IF-4 (S-3). The other lead to lug 3 of terminal strip PP (NS).

  ( ) C44. One lead to lug 7 of V6 (S-3). The other lead to lug 4 of terminal strip PP (S-2).

( ) C30. One lead to lug 6 of V4 (S-2). The other lead to the solder lug near lug 7 of V4 (NS).

( ) C31. One lead to lug 2 of terminal strip KK (S-3). The other lead to the solder lug near lug 7 of V4 (NS).

( ) C32. One lead to lug 2 of IF-3 (S-2). The other lead to the solder lug near lug 7 of V4 (NS).

( ) C127. One lead to lug 2 of V4 (S-2). The other lead to the solder lug near lug 7 of V4 (S-5).

( ) C69. One lead to lug 6 of V7 (S-2). The other lead to lug 2 of terminal strip MM (NS).

( ) C67. One lead to lug 5 of V7 (S-3). The other lead to lug 2 of terminal strip MM (S-3).

( ) C68. One lead to lug 1 of V7 (S-2). The other lead to the solder lug near lug 3 of V7 (NS).

( ) C40. One lead to lug 3 of terminal strip MM (S-3). The other lead to the solder lug near lug 3 of V7 (S-4).

( ) C29. One lead to lug 2 of IF-2 (S-2). The other lead to the solder lug near lug 4 of V3 (NS).

( ) C28. One lead to lug 4 of IF-2 (S-2). The other lead to the solder lug near lug 4 of V3 (S-6).

( ) C26. One lead to lug 3 of V3 (S-2). The other lead to lug 3 of terminal strip LL (NS).

( ) C37. One lead to lug 5 of terminal strip LL (S-4). The other lead to lug 3 of terminal strip LL (NS).

( ) C27. One lead to lug 4 of LL (S-5). The other lead to lug 3 of LL (NS).

( ) C25. One lead to lug 7 of V3 (S-2). The other lead to lug 3 of LL (S-4).

( ) C125. One lead to lug 1 of V9 (S-2). The other lead to the solder lug near lug 7 of V8 (NS).

( ) C43. One lead to lug 1 of LL (S-3). The other lead to the solder lug near lug 7 of V8 (NS).

( ) C42. One lead to lug 7 of V8 (NS). The other lead to the solder lug near lug 7 of V8 (S-4).

( ) C128. One lead to lug 2 of V5 (S-2). The other lead to lug 1 of the phone jack (NS).

( ) R35. Cut one lead of a 1 KΩ 2 watt (brown-black-red) resistor to 7/8". Cut the other lead to 3/8". Bend the 7/8" lead at a right angle close to the resistor body and connect to lug 5 of V9 (S-1). Do not try to crimp the lead. Insert the lead through the lug hole and solder. Connect the other lead to lug 1 of terminal strip KK (S-2).

( ) Prepare both ends of a 13" length of shielded audio cable as shown in Detail 15B on Page 61.

( ) In a like manner, prepare both ends of a 17" length of shielded audio cable.

( ) Also, prepare both ends of the remaining 23" length of shielded audio cable.

( ) Insert either end of the longest shielded audio cable through grommet F from the top side of the chassis. Dress toward the phone jack and connect the shielded braid to lug 1 (S-2). Connect the inner conductor to lug 2 (S-2). Now bend lug 2 down slightly so there is no possibility of a short to the bottom plate when it is installed.

( ) In a like manner, insert the 17" length audio cable through grommet F. Connect the inner conductor to lug 5 of terminal strip PP (S-2). CAUTION: Use a pair of pliers between the body of the diode and the connection to conduct the heat away. Connect the shield braid to lug 3 of PP (NS). Cut off any excess braid.

( ) Insert the remaining audio cable through grommet F and connect the inner conductor to lug 2 of terminal strip PP (S-3). Connect the shielded braid to lug 3 of PP (S-3). Make sure there are no small strands of wires touching the adjacent lugs or component leads.

( ) C35. Cut both leads of a .56 $\mu\mu$f (green-blue-gray) tubular capacitor to 1-1/4" and place 1" lengths of sleeving over each lead. Connect one lead to lug 1 of IF-4 (S-2). Dress the capacitor as shown and connect the other lead to lug 7 of V8 (S-3).

This completes all wiring of the receiver section. All connections should be soldered except FT-5 in the receiver subchassis. Tube socket lugs 5 and 6 of V8; 2, 3, 4, and 6 of V9; and lug 2 of terminal strip NN are not used. Check for solder drops, wire clippings, etc., that may cause possible shorts. Check all tube socket lugs and terminal strip lugs to see that none are touching each other. If any doubt exists, the lugs should be pried apart until obvious spacing can be seen between them.

( ) Refer to Detail 15C and locate the left-hand chassis end plate (#205-M250). Install the end plate on the receiver side of the chassis, using two #6 sheet metal screws at the locations shown.

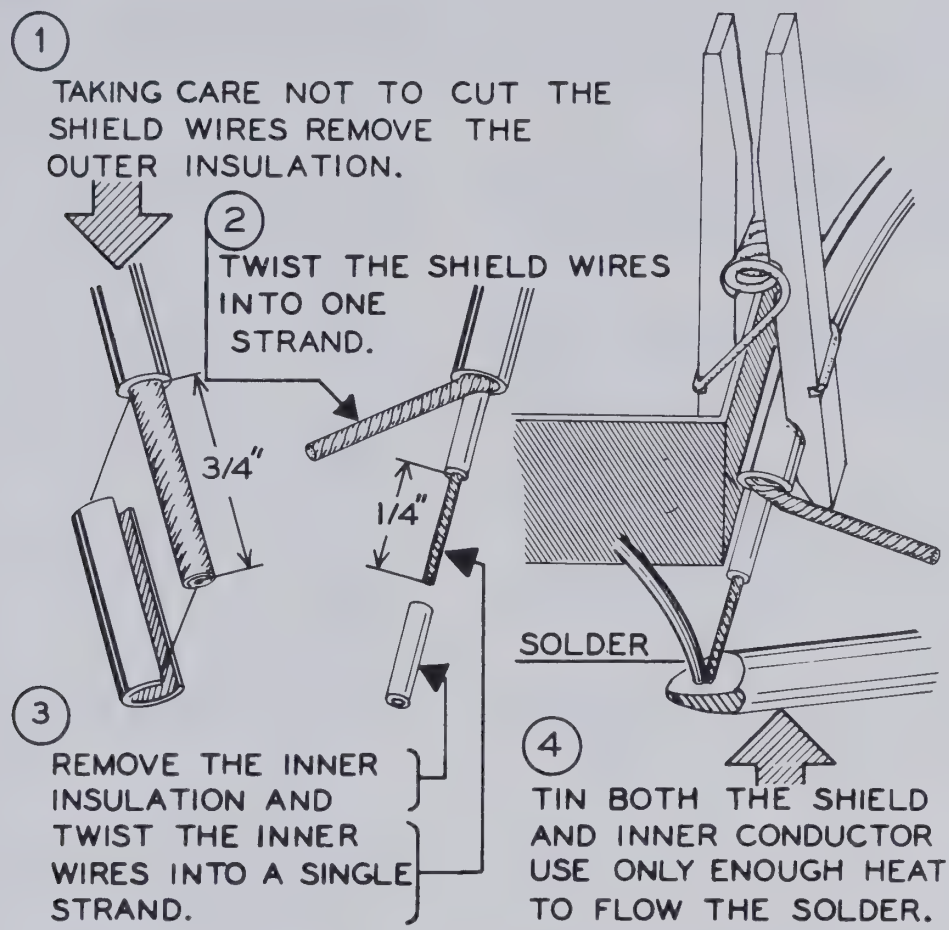
( ) Locate the three 1/4" plastic cable clamps and clip off the short mounting tabs at the bend. See the insert on Detail 15C.

( ) Place the two shorter audio cables in a clamp and mount it at the second hole in the end plate from the rear apron of the chassis. Use a #6 sheet metal screw.

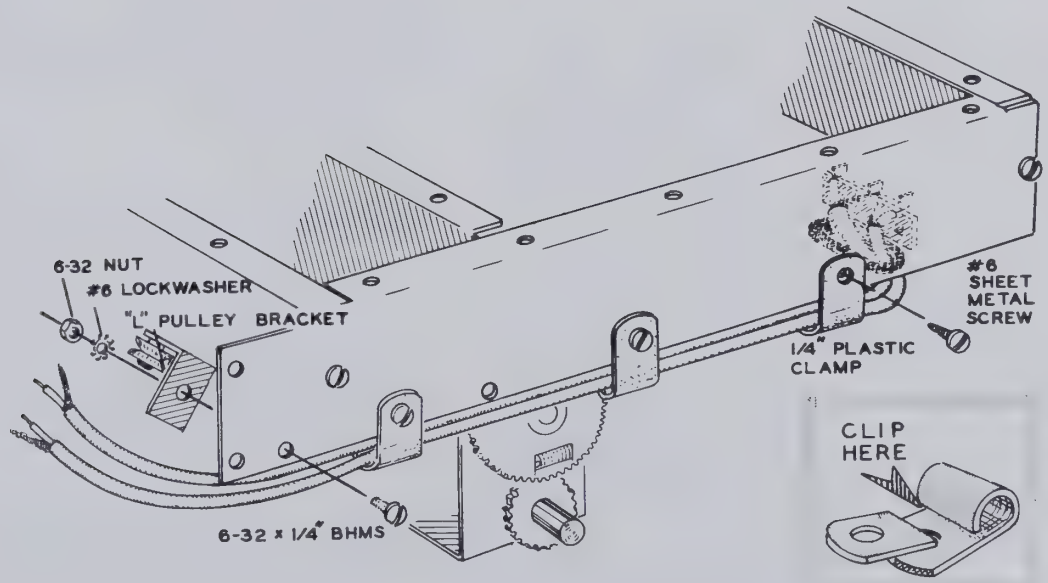
( ) In a like manner, mount the other two clamps on the end plate as shown. Use #6 sheet metal screws.

( ) Locate an "L" pulley bracket (#100-M302) and mount it at the front of the end plate as shown. Use 6-32 hardware. Tilt the pulley bracket at a 45 degree angle.

This completes assembly of the receiver side of the main chassis.



Detail 15B



Detail 15C

Refer to Pictorial 16 for the following steps.

( ) Turn the main chassis around to the transmitter section.

( ) Bend the four crystal socket lugs that are near switch SW to about a 45 degree angle. This will allow slipping a wire through the four lugs.

( ) Cut a bare wire to 1-3/4" and slip the wire through the four crystal socket lugs bent to a 45 degree angle. Solder lug 2 of X1 (S-1), lug 2 of X2 (S-2), and lug 2 of X3 (S-2).

( ) Cut a bare wire to 1-1/4" and connect one end to lug 1 of X1 (S-1). Connect the other end to lug 3 of switch SW (S-1).

( ) Cut a bare wire to 1" and connect one end to lug 1 of X2 (S-1). Connect the other end to lug 4 of switch SW (S-1).

( ) Cut a bare wire to 1-1/4" and connect one end to lug 1 of X3 (S-1). Connect the other end to lug 5 of SW (S-1).

( ) Cut a bare wire to 1-1/2" and connect one end to lug 1 of X4 (S-1). Connect the other end to lug 6 of SW (S-1).

( ) Connect the two short gray leads from BO#5 to lug 2 of SW (S-2).

( ) Connect the long gray lead from BO#5 to lug 1 of SW (S-1).

( ) Cut a white hookup wire to 3" and strip both ends 3/8". Connect one end to lug 4 of V13 (NS). Connect the other end to lug 4 of V14 (NS).

( ) Cut a white hookup wire to 2-1/2" and strip both ends 3/8". Connect one end to lug 4 of V14 (NS). The other end will be connected later.

( ) Connect the lead from tubular trimmer capacitor TC-5 to lug 1 of trimmer capacitor PC-1 (NS). Cut off excess lead length.

( ) Connect the lead from tubular capacitor TC-6 to lug 1 of trimmer capacitor PC-2 (S-1). Cut off excess lead length.

( ) Slip a short length of bare wire through lug 9 (NS) and connect it to the center post of V13 (NS). Connect the other end to the solder lug near lug 9 of V13 (NS). Now solder the center post (S-1) and lug 9 (S-2).

( ) Bend lugs 2 and 3 of V14 over to the center post (NS).

( ) C100. Cut one lead of a .001 μfd disc ceramic capacitor to 3/8". Cut the other lead to 3/4". Slip the 3/4" lead through the center post of V14 and connect it to the solder lug near lugs 1 and 7 of V14 (NS). Now solder the center post (S-4). Connect the other lead to lug 4 of V14 (S-3).

( ) Cut a black hookup wire to 2" and strip both ends 3/8". Connect one end to lug 7 of V14 (NS). Connect the other end to lug 1 of terminal strip AA (NS).

( ) Cut a black hookup wire to 2-1/2" and strip both ends 3/8". Connect one end to lug 2 of V15 (NS). Connect the other end to lug 4 of terminal strip BB (NS).

( ) Cut a red hookup wire to 2" and strip both ends 3/8". Connect one end to lug 2 of terminal strip BB (NS). Connect the other end to lug 5 of terminal strip BB (NS).

( ) R62. Cut both leads of a 100 KΩ (brown-black-yellow) resistor to 3/8". Connect one lead to lug 8 of V13 (NS). Connect the other lead to the solder lug near lug 9 of V13 (NS).

( ) R66. Cut both leads of another 100 KΩ (brown-black-yellow) resistor to 1/2". Connect one lead to lug 2 of V13 (NS). Connect the other lead to lug 3 of terminal strip AA (NS).

( ) Connect a short length of bare wire from lug 5 of V13 (S-1) to lug 3 of terminal strip AA (NS).

( ) Cut a bare wire to 2-1/4" and connect one end to lug 8 of SW (S-1). Slip a 1-3/4" length of sleeving over the wire and connect the other end to lug 8 of V13 (S-2).

( ) C87. Cut both leads of a .001 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 2 of X4 (S-2). Connect the other lead to lug 7 of V13 (NS).

( ) R63. Cut both leads of a 47 KΩ (yellow-violet-orange) resistor to 1/2". Connect one lead to lug 7 of V13 (S-2). Connect the other lead to lug 5 of terminal strip AA (NS).

( ) Cut a bare wire to 1-1/2" and connect one end to lug 1 of V13 (S-1). Connect the other end to TC-5 by making a one turn wrap around the tubular capacitor (NS).

( ) R67. Cut both leads of a 1 KΩ (brown-black-red) resistor to 3/8". Connect one lead to lug 3 of V13 (NS). Connect the other lead to lug 2 of terminal strip AA (NS).

( ) C92. Cut both leads of a 100 μμf mica capacitor to 3/8". Connect one lead to lug 2 of V13 (S-2). Connect the other lead to lug 6 of V13 (NS). Dress the capacitor upright across the tube socket as shown.

( ) R68. Cut both leads of a 47 KΩ (yellow-violet-orange) resistor to 1/2". Connect one lead to lug 1 of V14 (NS). Connect the other lead to the solder lug near lugs 1 and 7 of V14 (NS).

( ) C101. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 7 of V14 (S-2). Connect the other lead to the solder lug near lug 7 of V14 (S-3).

( ) C98. Cut both leads of a 36 μμf mica capacitor to 1/2". Connect one lead to lug 1 of V14 (S-2). Connect the other lead to lug 1 of trimmer capacitor PC-1 (S-2).

( ) R69. Cut both leads of a 56 KΩ (green-blue-orange) resistor to 3/8". Connect one lead to lug 6 of V14 (NS). Connect the other lead to lug 2 of terminal strip BB (NS).

( ) C102. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 6 of V14 (S-2). Connect the other lead to lug 3 of terminal strip BB (NS).

( ) C108. Cut both leads of a .001 μfd disc ceramic capacitor to 1/4". Connect one lead to lug 2 of V15 (S-2). Connect the other lead to the center post of V15 (NS).

( ) Bend lug 4 of V15 over to the center post. Now solder the center post on the outside only (S-2). Avoid getting any solder inside the center post.

( ) Bend lug 5 of V15 edgewise as shown.

( ) R70. Cut both leads of a 33 KΩ (orange-orange-orange) 1/2 watt resistor to 3/8". Connect one lead to lug 3 of tube socket V15 (NS). Connect the other lead to the solder lug near lug 4 of V14 (NS).

( ) R71. Cut both leads of a second 33 KΩ (orange-orange-orange) 1/2 watt resistor to 3/8". Connect one lead to lug 1 of tube socket V15 (NS). Connect the other lead to the solder lug near lug 4 of V14 (S-2).

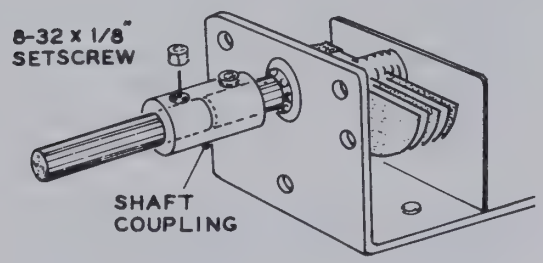
( ) C107. Cut one lead of a 22 μμf mica capacitor to 1/4". Connect the 1/4" lead to lug 3 of V15 (S-2). Connect the other lead to TC-6 (NS). Cut off excess lead.

( ) C106. Cut one lead of the other 22 μμf mica capacitor to 3/8". Cut the other lead to 3/4". Connect the shorter lead to lug 1 of V15 (S-2). Connect the longer lead to lug 5 of V14 (NS).

( ) R72. Cut both leads of a 100 Ω (brown-black-brown) 2 watt resistor to 3/8". Bend both leads at right angles close to the resistor body and insert one lead in the eyelet of lug 4 of terminal strip BB (S-1). Do not solder the top of the lug. Insert the other lead in the eyelet of lug 1 of terminal strip AA (S-1).

( ) RFC-8. Cut both leads of the .45 μh RF choke (#45-39) to 3/8". Connect one lead to lug 1 of terminal strip BB (NS). Connect the other lead to lug 2 of BB (NS).

( ) C90-A, B, C. Locate the other 3-gang, 5-15 μμf per section variable capacitor (#26-68). Slip a shaft coupling over the groove on the capacitor shaft. Secure the shaft coupling in place using two 6-32 x 1/8" slotted setscrews. See Detail 16A. Now bend the three lugs at a 90 degree angle from the capacitor frame.



Detail 16A

Refer to Pictorial 17 for the following steps.

( ) Mount the 3-gang variable capacitor on top of the main chassis with the shaft toward the front, over the three 1/2" holes. Use the three remaining 4-40 x 1/8" screws with the #4 lockwashers under the screwheads to secure the capacitor in place.

( ) Locate the VFO plate coil (#40-124, yellow color dot) and install it at location L-10. Position it so that the locating pin falls in line with the slot in the chassis.

( ) Locate the multiplier plate coil (#40-126, green color dot) and install at location L-11.

( ) Locate the key jack (#436-4) and mount it on the rear chassis apron, using a thick control lockwasher, flat washer, and control nut. Position as shown.

( ) Connect a short length of bare wire between the center lug of phono socket AB (NS) and lug 1 of coil L-10 (S-1).

( ) C86. Cut both leads of a 100 μμf mica capacitor to 3/4". Connect one lead to the center lug of phono socket AB (S-2). Connect the other lead to lug 7 of switch SW (S-1).

( ) C91. Cut both leads of a .001 μfd disc ceramic capacitor to 1/2". Connect one lead to the solder lug near lug 9 of V13 (S-3). Connect the other lead to lug 1 of coil L-11 (NS).

( ) C89. Cut both leads of a 20 μμf disc ceramic capacitor to 1/2". Connect one lead to lug 1 of coil L-11 (NS). Connect the other lead to lug 2 of L-11 (NS). Dress the capacitor as shown.

( ) R64. Cut both leads of a 1 KΩ (brown-black-red) resistor to 1". Connect one lead to lug 1 of coil L-11 (S-3). Connect the other lead to lug 5 of terminal strip AA (NS).

( ) C93. Cut both leads of a .001 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 1 of the key jack (S-1). Connect the other lead to lug 2 of coil L-10 (NS).

( ) R65. Cut both leads of the remaining 1 KΩ (brown-black-red) resistor to 1/2". Connect one lead to lug 2 of coil L-10 (S-2). Connect the other lead to lug 5 of terminal strip AA (NS).

( ) Cut a bare wire to 1-3/4" and connect one end to lug 6 of V13 (S-2). Slip a 1-3/8" length of sleeving over the bare wire and connect the other end to lug 2 of L-11 (NS).

( ) Connect the yellow lead from BO#4 to lug 2 of the key jack (S-1).

( ) Connect the red lead from BO#3 to lug 5 of terminal strip AA (S-4).

( ) Connect the blue lead from BO#2 to lug 5 of terminal strip BB (NS).

( ) Cut a black hookup wire to 3" and strip one end 1/2". Strip the other end 3/8" and connect this end to lug 3 of the key jack (S-1). Connect the other end to lug 1 (NS), and then to lug 2 (S-2) of terminal strip AA.

( ) C94. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 4 of V13 (S-2). Connect the other lead to lug 3 of terminal strip AA (NS).

( ) C96. Cut both leads of another .001 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 3 of V13 (S-2). Connect the other lead to lug 3 of terminal strip AA (NS).

( ) C119. Cut both leads of a .02 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 1 of terminal strip AA (S-4). Dress the capacitor as shown and connect the other lead to lug 3 of terminal strip AA (S-5).

( ) C109. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 3 of terminal strip BB (NS). Connect the other lead to lug 4 of BB (S-2).

( ) C99. Cut both leads of a .001 μfd disc ceramic capacitor to 1/2". Connect one lead to lug 3 of terminal strip BB (NS). Connect the other lead to lug 5 of BB (NS).

( ) C103. Cut both leads of a .001 μfd disc ceramic capacitor to 3/8". Connect one lead to lug 2 of terminal strip BB (S-4). Connect the other lead to lug 3 of BB (NS).

( ) C88. Cut both leads of a 10 μμf disc ceramic capacitor to 5/8". Connect one lead to lug 2 of coil L-11 (S-3). Connect the other lead to lug 1 of the 3-gang variable capacitor (S-1).

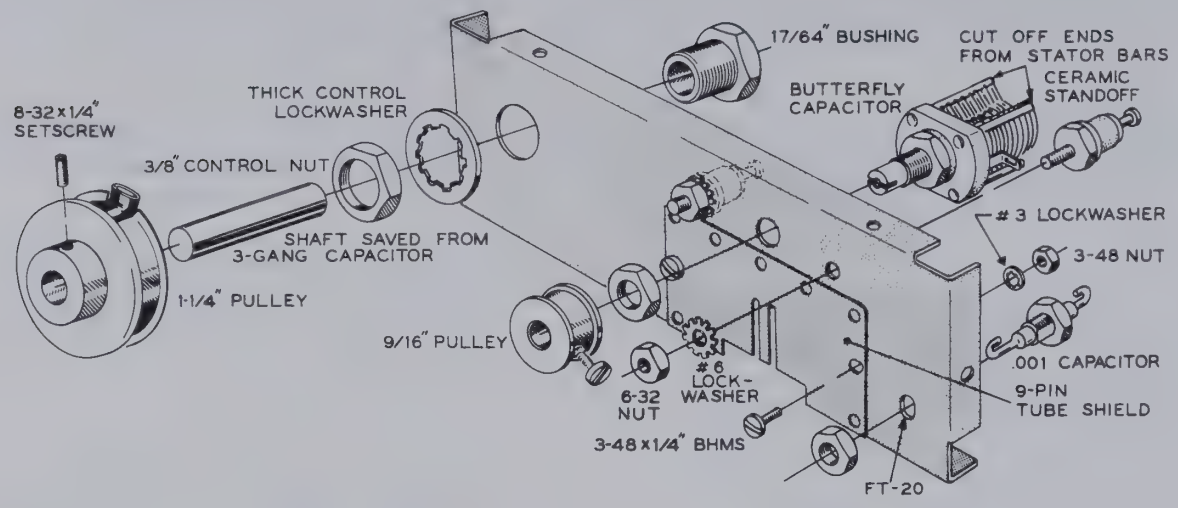
( ) Cut a bare wire to 1-1/4" and connect one end to lug 2 of trimmer PC-1 (S-1). Connect the other end to lug 2 of the 3-gang variable capacitor (S-1).

( ) Cut a second bare wire to 1-1/4" and connect one end to lug 2 of trimmer PC-2 (S-1). Connect the other end to lug 3 of the 3-gang variable capacitor (S-1).

( ) L-12. Locate the doubler plate coil (#40-344, this is the 8-turn spring-wound coil with a hook at one end). Place the hook over tubular capacitor TC-5 (S-2). Place the other lead of the coil next to lug 5 of terminal strip BB (S-4).

( ) L-13. Locate the driver plate coil L-13 (#40-346, this is the 11-turn coil with a center-tapped lead attached). Cut one coil lead to 1" in length and cut the other coil lead to 1/2" in length. Connect the shorter coil lead to lug 5 of tube socket V14 (S-2). Connect the other coil lead to tubular capacitor TC-6 (S-2). Connect the center-tapped lead to lug 1 of terminal strip BB (S-2). Be sure and position the coil exactly as shown.

This completes wiring of the transmitter exciter section except for connecting the filament leads (two white leads from BO#2 and one white lead from lug 4 of V14). All other connections should be soldered except lug 3 of terminal strip BB. Lug 4 of terminal strip AA is not used. Recheck the work for possible errors and check for solder drops, wire clippings, etc., that could cause short circuits.



Pictorial 18

Refer to Pictorial 18 for the following steps.

( ) Locate the final amplifier shield plate (#205-M249) and mount a tube pin shield (#205-M87) over the rectangular cutout. Use 3-48 x 1/4" hardware. Mount the tube pin shield with the slots toward the rectangular opening.

( ) C112. Locate the 3.2-11 $\mu\mu$f butterfly capacitor (#26-39) and cut off the ends of each stator bar as shown. Now mount it in the 1/4" hole and secure in place with the nut supplied. Position the rotor ground lug down.

( ) Locate two ceramic stand-offs and install them on the transmitter shield plate, on the side shown. Use #6 lockwashers under 6-32 nuts.

( ) Bend both stator lugs of the capacitor over to the ceramic stand-offs so that a solder connection can be made. Do not solder yet.

( ) Mount a .001 μfd feed-through capacitor at location FT-20. Use the nut supplied with the capacitor.

( ) Locate a 3/8" long x 17/64" ID shaft bushing. (This bushing should allow the brass tubing to pass through it freely.) Install it in the 3/8" hole, from the side shown, using a thick control lockwasher and control nut.

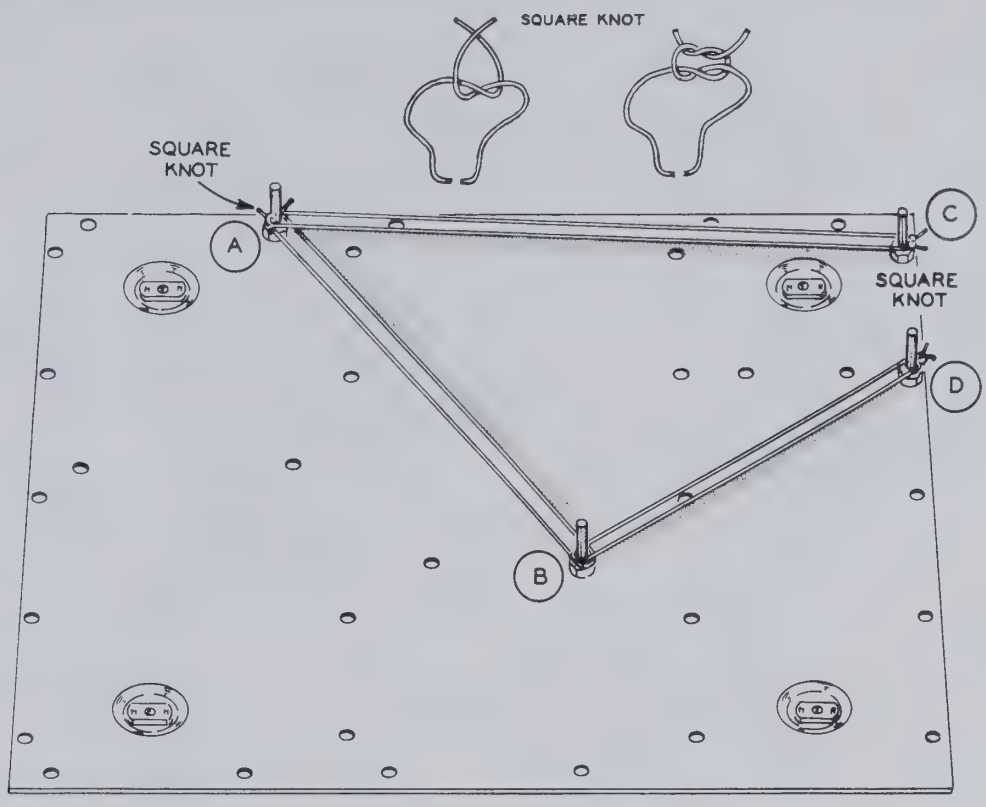
( ) Locate the 9/16" string diameter x 3/16" ID butterfly capacitor drive pulley (#466-13) and start a 3-48 x 1/4" screw in the threaded hole on the pulley. With the capacitor plates fully meshed, install the pulley on the capacitor shaft with the 3-48 screw head pointing toward FT-20.

( ) Locate the 1-1/4" string diameter pulley (#100-M286) and start an 8-32 x 1/4" Allen head setscrew in the pulley bushing.

( ) Also slip a short length of small insulating sleeving over the tab in the pulley rim. Then cut the sleeving off flush with the edge of the tab.

( ) Locate the short length of shaft that was broken off of the 3-gang receiver tuning capacitor and install the pulley on the shaft. Insert the shaft in the shaft bushing mounted on the transmitter shield. This shaft is used only for a jig setup and will be removed at a later time.

( ) Locate the chassis bottom plate (#205-M255). Study Detail 18A and orient the bottom plate with the embossed feet down, exactly as shown. Temporarily install four 6-32 x 5/8" screws at locations A, B, C, and D, using 6-32 nuts.



Detail 18A

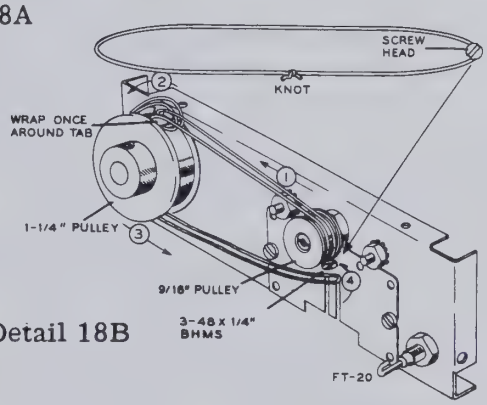
( ) Locate the long length of dial cord without eyelets and cut off a 22" length. Place the center of the dial cord around the screw at location A, as shown. Place the two ends of the dial cord around the screw at location C. Now tie the two ends together, using a square knot (see the insert on Detail 18A), so that the cord forms a tight loop around both screws. Cut off the excess cord about 1/4" from the knot.

( ) In a like manner cut another length of dial cord to 20" and repeat the above step with this dial cord, except form the loop between the screws at locations A and B.

( ) Cut another length of dial cord to 14" and, as in the two preceding steps, form the loop between screws B and D.

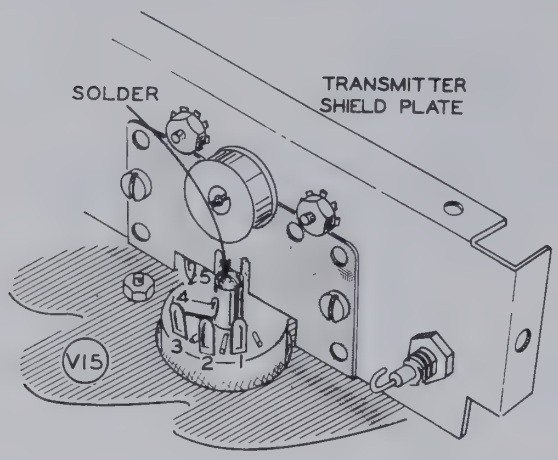
( ) Remove the three dial cord loops and the hardware from the bottom plate. Set everything aside except the medium length dial cord loop (dial cord loop between A and B).

( ) Using the medium dial cord loop, position the knot near the center of the loop as shown in Detail 18B.



Detail 18B

( ) Place one loop end over the 3-48 screw in the 9/16" capacitor pulley. Following the numbered arrows, make a 1/2 turn around the pulley, then over to the 1-1/4" pulley, and form a loop, as shown, around the tab in the pulley rim. Continue around the 1-1/4" pulley, and back to the 9/16" capacitor pulley. Temporarily loosen the 3-48 screw and slip the pulley off of the capacitor shaft, holding the dial cord in place. Now place the other loop end over the 3-48 screw and reinstall the pulley on the capacitor shaft. Be sure the tab on the large pulley and the 3-48 screw on the small pulley are oriented as shown. Now tighten the 3-48 screw. Be sure the dial cord is very tight.



Detail 18C

( ) Referring to Detail 18C, mount the transmitter shield plate to the main chassis by placing the socket pin shield across tube socket V15. The shield should fall between lugs 1 and 9, and lugs 4 and 5, with the center section inserted in the tube socket center post. It may be necessary to heat the center post if some difficulty is experienced in seating the shield plate properly. This could be caused by solder being inside the center post from previous steps. Reposition the disc capacitor and two mica capacitors if necessary to make clearance for the capacitor pulley.

( ) Use 6-32 x 1/4" hardware to secure the transmitter shield plate to the main chassis.

Refer to Pictorial 19 for the following steps.

( ) Solder the center post and lug 5 of V15 to the socket pin shield.

( ) At BO#2, cut both white leads off to 3/4" in length from the breakout and save the heavy white lead that is cut off. Strip both white leads at BO#2 3/8" and connect them to FT-20 (NS).

( ) Connect the free end of the white lead coming from lug 4 of V14 to FT-20 (NS).

( ) C125. Cut both leads of a .02 μfd disc ceramic capacitor to 5/8". Connect one lead to lug 3 of terminal strip BB (S-5). Connect the other lead to FT-20 (S-4).

( ) Strip one end of the short length of heavy white wire clipped off at BO#2 1/4" and connect this end to lug 9 of V15 (S-1). Connect the other end to FT-20 on the final amplifier side of the transmitter shield plate (S-1).

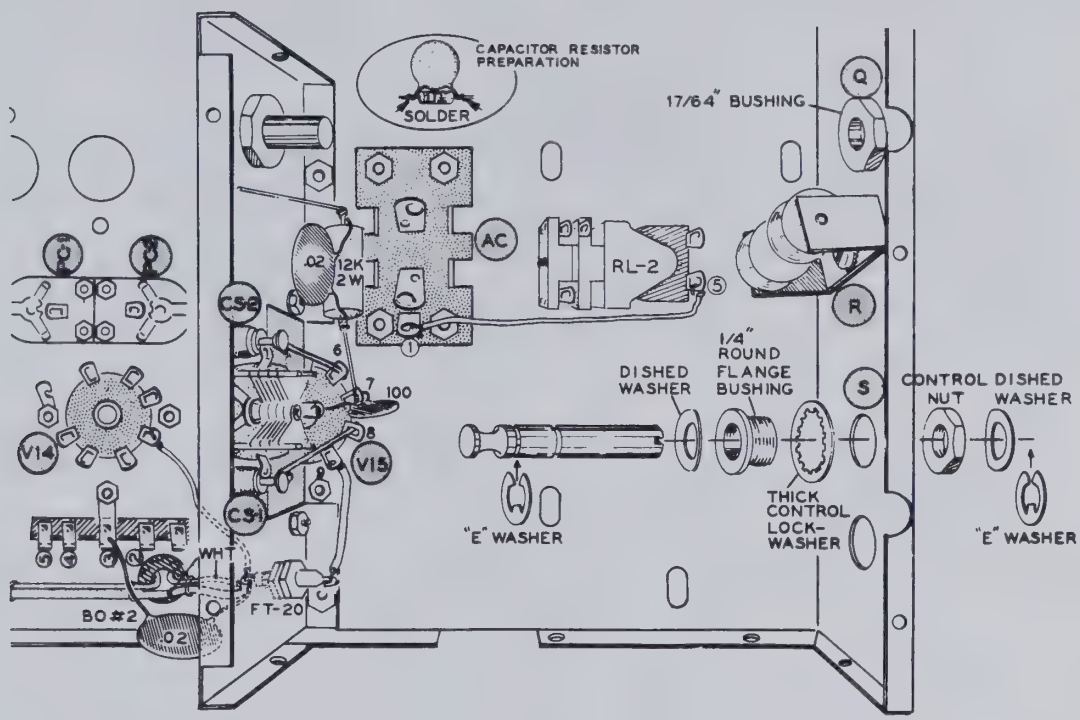
( ) C110. Cut both leads of a 100 μμf disc ceramic capacitor to 1/4". Connect one lead to lug 7 of V15 (NS). Connect the other lead to the rotor lug (ground lug) of the butterfly capacitor (S-1).

( ) Cut a #16 bare wire to 1-1/4". Connect one end to lug 8 of V15 by inserting the end of the wire in the lug hole (S-1). Connect the other end to ceramic stand-off CS-1 (NS).

( ) Cut a second length of #16 bare wire to 1-1/4". Connect one end to lug 6 of V15 (S-1). Connect the other end to ceramic stand-off CS-2 (NS).

( ) R73, C111. Cut one lead of a 12 KΩ (brown-red-orange) 2 watt resistor to 7/8". Mount a .02 μfd disc ceramic capacitor on the resistor as shown in the insert on Pictorial 19. Solder both connections and clip off the excess capacitor leads.

( ) Bend the long lead of the resistor-capacitor combination at right angles close to the resistor body and in line with the capacitor. Bend the shorter lead 1/8" from its end and connect it to lug 7 of V15 (S-2). Dress the resistor-capacitor combination parallel to the transmitter shield as shown. The long lead will be connected later.



Pictorial 19

( ) Install the other 3/8" long x 17/64" ID shaft bushing at location Q on the front apron of the chassis. Insert the bushing through the hole from inside the chassis and secure, using a thick control lockwasher and control nut.

( ) Locate two "L" pulley brackets and start a 6-32 x 1/4" screw with a #6 lockwasher under the screw head, through the mounting holes of each bracket as shown. Mount the brackets on the inside of the front apron at location R. Use a 6-32 nut to secure brackets in place. Orient the two pulleys in line with hole S as shown.

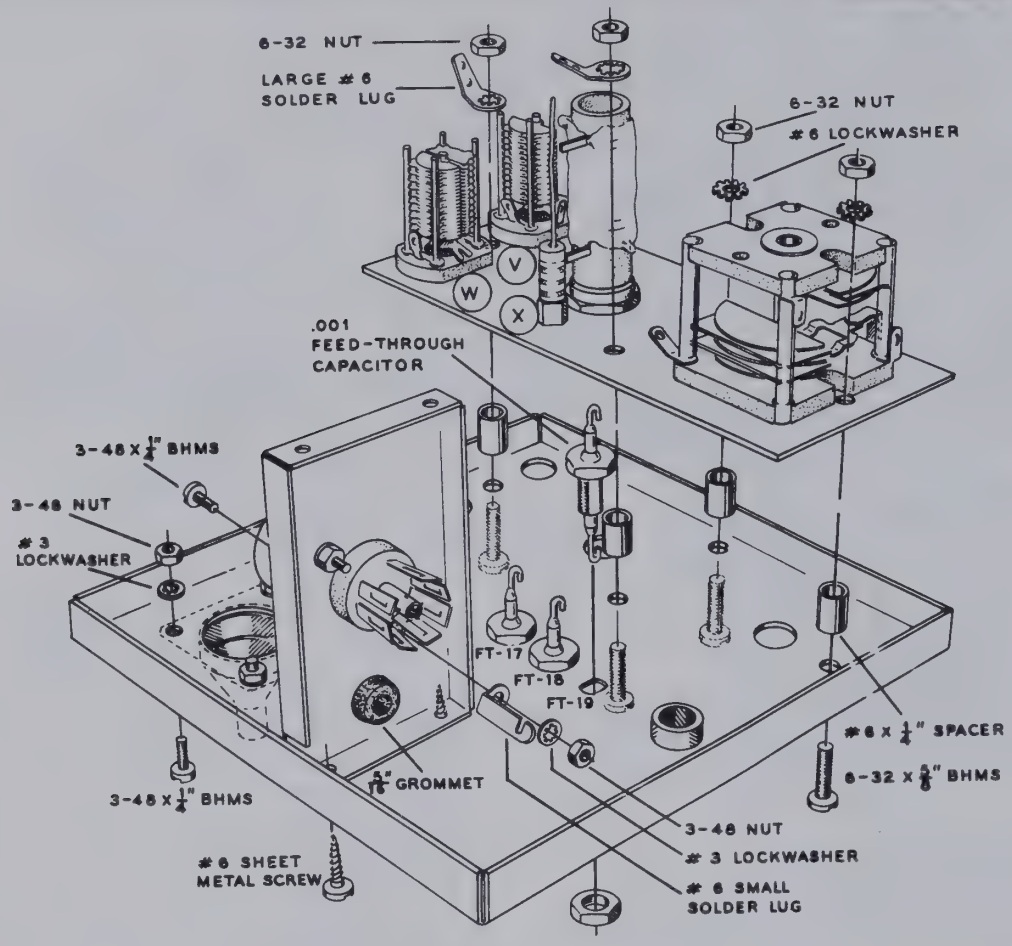
( ) Install a 1/4" long round flange bushing at location S from inside the front apron. Use a thick control lockwasher under the bushing flange and secure with a control nut.

( ) Locate the dial cord drive shaft with a screwdriver slot on the end of the shaft. Place an "E" washer in the E groove near the dial cord groove of the shaft. Then slip a dished spring washer over the shaft and insert the shaft through bushing S, with the dial cord groove inside the chassis. Slip another dished spring washer over the shaft and, with pressure applied to the end of the shaft, place another "E" washer in the other E groove on the shaft.

( ) Locate the antenna relay (#69-17) and mount it on the main chassis at location RL-2. Use the four remaining 3-48 x 1/8" screws with #3 lockwashers under the screw heads. Position the relay as shown.

( ) Cut a black hookup wire to 3-1/2" and strip both ends to 3/8". Connect one end to lug 1 of the double phono socket AC (S-1). Dress the wire on the chassis over to the relay, then up alongside the relay coil and connect the end to lug 5 of RL-2 (S-1).

This completes preliminary wiring and installation of parts in the final amplifier section. Set the main chassis aside.



Pictorial 20

VFO ASSEMBLY

To achieve the utmost in stability from the VFO, the following wiring and assembly should be done very carefully, placing wires and components exactly as shown and making sure all hardware is securely tightened.

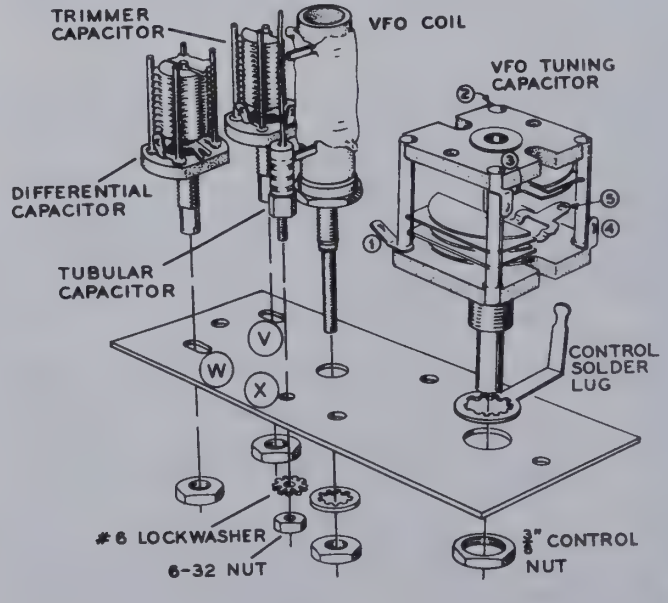
Refer to Pictorial 20, Detail 20A, and Detail 20B for the following steps.

( ) Locate the VFO heat-sink plate (#205-M244) and position it as shown in Detail 20A.

( ) C80. Locate the VFO tuning capacitor (#26-43) and mount it in the largest hole on the heat-sink plate. Use a control solder lug between the capacitor and plate. Orient the solder lug and capacitor as shown, then secure with a control nut.

( ) Bend lugs 2, 3, and 4 on the capacitor down against the stator bars. Bend the control solder lug over so that its end is flat on the rotor lug (lug 5) of the capacitor. Solder the two lugs together.

( ) Locate the VFO coil (#40-329) and mount it on the heat-sink plate in the position shown. Use the hardware supplied with the coil.



Detail 20A

( ) C79. Locate the 20 $\mu\mu$f air trimmer capacitor (#26-24) and mount it on the heat-sink plate at location V, oriented as shown. Use the nut supplied with the capacitor to secure it in place.

( ) C76. Locate the differential capacitor (#26-70) and mount it at location W, using the nut supplied with the capacitor.

( ) C78. Locate the 10 $\mu\mu$f (yellow-brown-black--black) N220 tubular ceramic capacitor with a 6-32 mounting stud. Mount the capacitor at location X, using a #6 lockwasher and 6-32 nut.

( ) Locate the VFO front panel housing (#100-M285) with the Oilite bearing already installed.

( ) Mount the coaxial shield hood at the large hole in the front panel housing. Use 3-48 x 1/4" hardware.

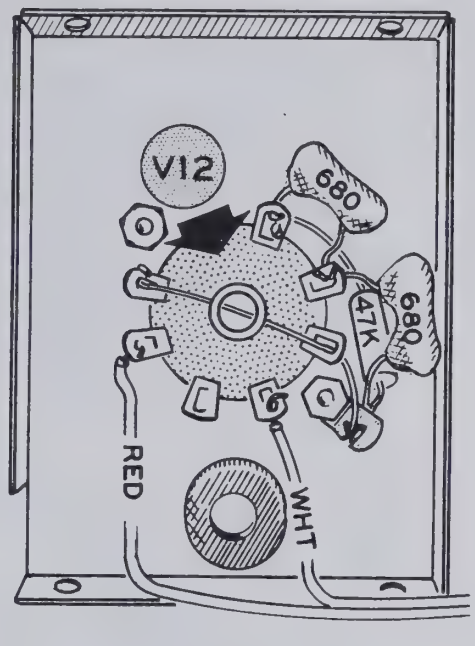
( ) Mount the three remaining .001 μfd feed-through capacitors at FT-17, FT-18, and FT-19. Use the nuts supplied with the capacitors.

( ) Now mount the VFO heat-sink plate to the front panel housing using the four 6-32 x 5/8" screws, four #6 x 1/4" spacers, and 6-32 nuts. Install a #6 solder lug on the screw near lug 1 of the VFO tuning capacitor and on the screw between capacitors V and W. Using a piece of tape across each screwhead will help hold the screws and spacers in place until the assembly is secured.

( ) Locate the VFO tube mounting bracket (#204-M340) and mount the 7-pin tube socket on the bracket, orienting the wide pin spacing as shown. Use 3-48 x 1/4" hardware with a #6 small solder lug installed on the screw near lugs 3 and 4.

( ) Install the 5/16" grommet in the 5/16" hole on the VFO tube mounting bracket.

( ) Referring to Detail 20B, slip a short length of bare wire through lug 7 (NS), through the center post (NS), through lug 3 (NS), and connect it to the solder lug of V12 (NS). Now solder lug 7 (S-1), the center post (S-2) and lug 3 (S-2).



Detail 20B

( ) R61. Cut both leads of a 47 KΩ (yellow-violet-orange) resistor to 1/2". Connect one lead to lug 1 (NS) and connect the other lead to the solder lug (NS).

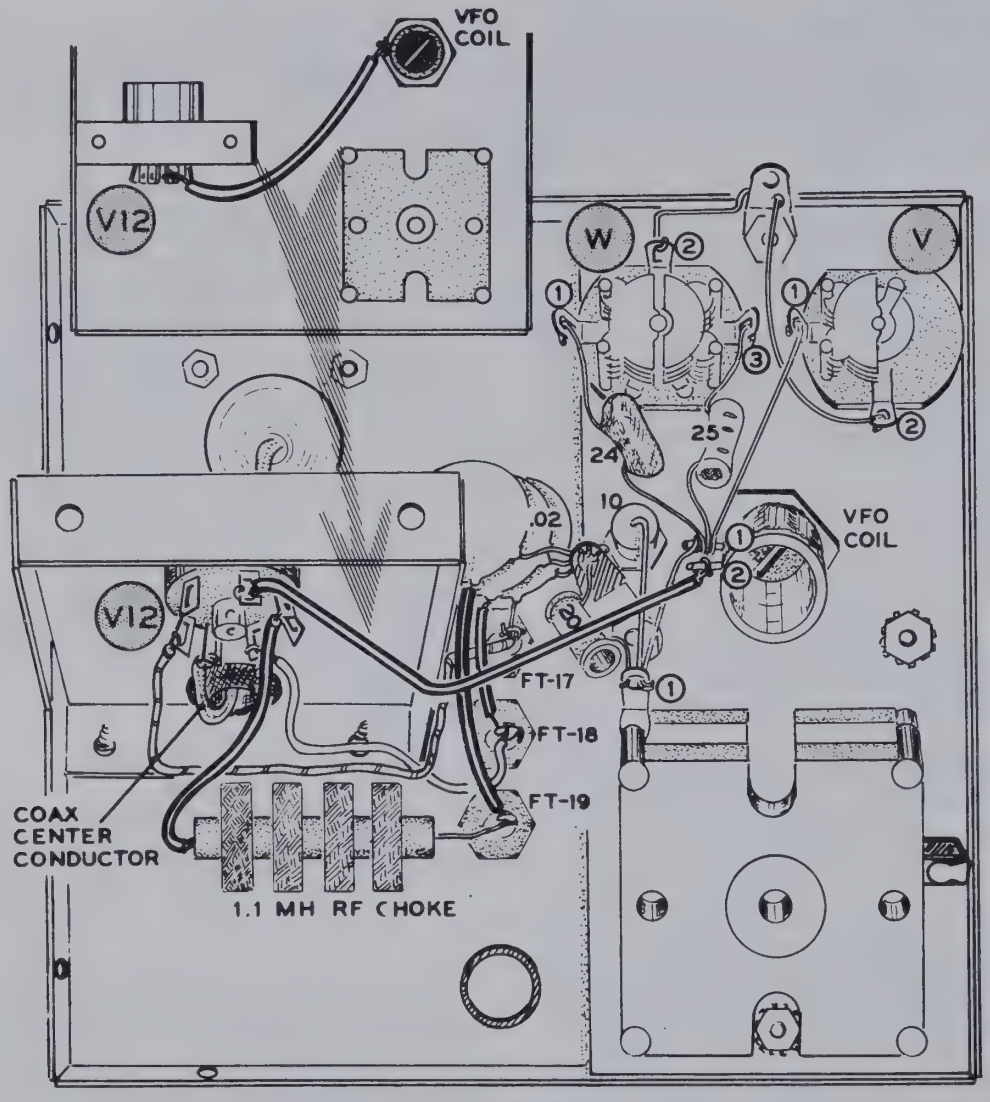
( ) C81. Cut both leads of a 680 $\mu\mu$f mica capacitor to 3/8". Connect one lead to lug 1 (NS). Connect the other lead to lug 2 (NS). Dress the capacitor straight up from the socket as shown.

( ) C82. Cut both leads of the other 680 $\mu\mu$f mica capacitor to 3/8". Connect one lead to lug 2 (NS). Connect the other lead to the solder lug (S-3).

( ) Cut a white hookup wire to 2-1/2" and strip both ends 3/8". Connect one end to lug 4 (S-1). The other end will be connected later.

( ) Cut a red hookup wire to 4" and strip both ends 3/8". Connect one end to lug 6 (S-1). The other end will be connected later.

( ) Mount the tube mounting bracket to the VFO front panel housing, using two #6 sheet metal screws. Position the bracket as shown in Pictorial 20.



Pictorial 21

Refer to Pictorial 21 for the following steps.

( ) Connect the white wire coming from lug 4 of V12 to FT-18 (NS). Dress the wire down against the front panel housing as shown.

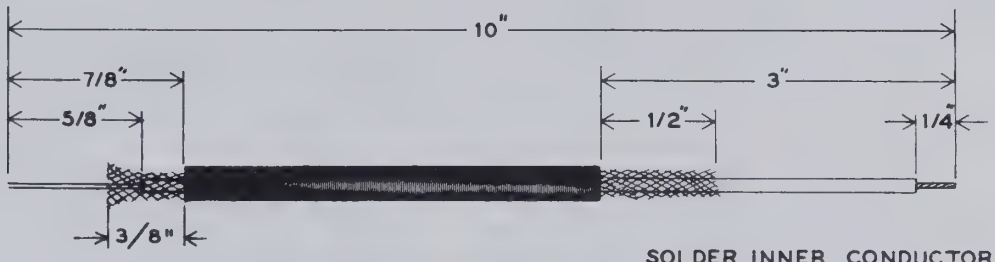
( ) Connect the red wire coming from lug 6 of V12 to FT-17 (NS). Dress the wire as shown.

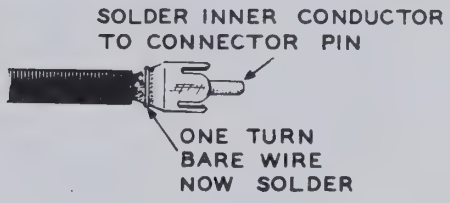
( ) C84. Cut both leads of a .02 μfd disc ceramic capacitor to 3/8". Connect one lead to FT-17 (S-2). Connect the other lead to solder lug near FT-17 (NS). Dress the capacitor as shown.

( ) C83. Cut one lead of a .02 μfd disc ceramic capacitor to 3/4". Cut the other lead to 1/2". Connect the 1/2" lead to the solder lug near FT-17 (NS). Slip a 1/2" length of sleeving over the other lead and connect it to FT-18 (S-2). Dress this capacitor on top of the other capacitor just installed.

( ) C85. Cut one lead of a .02 μfd disc ceramic capacitor to 1-1/8". Cut the other lead to 1/2" and connect it to the solder lug near FT-17 (NS). Slip a 3/4" length of sleeving over the other lead and connect it to FT-19 (NS). Dress this capacitor on top of the other two capacitors installed.

( ) C77. Cut both leads of the 20 μμf (black-red-black-black--green) NPO tubular ceramic capacitor to 3/8". Connect one lead to lug 1 of the VFO tuning capacitor (NS). Connect the other lead to the solder lug near FT-17 (S-4).





Detail 21A

( ) C78. Cut the lead on the 10 $\mu\mu$f N220 tubular ceramic capacitor mounted to the heat-sink plate to 7/8". Connect the lead to lug 1 of the VFO tuning capacitor (NS).

( ) Bend the solder lug between capacitors W and V straight up as shown.

( ) Feed a length of bare wire through the solder lug between capacitors W and V, and connect it to lug 2 of capacitor V (S-1). Dress the bare wire close to the chassis. Connect the other end to lug 2 of capacitor W (S-1). Now solder the solder lug (S-2).

( ) Connect a short length of bare wire from lug 1 of the VFO tuning capacitor (S-3) to terminal 1 of the VFO coil (NS).

( ) Connect a length of bare wire from terminal 1 of the VFO coil (NS) to lug 1 of capacitor V (S-1).

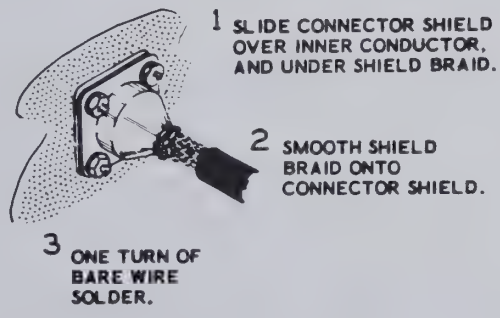
( ) C74. Cut both leads of the 25 $\mu\mu$f (violet-red-green-black--green) N750 tubular ceramic capacitor to 5/8". Connect one lead to lug 3 of capacitor W (S-1). Connect the other lead to terminal 1 of the VFO coil (NS).

( ) C75. Cut both leads of the 24 $\mu\mu$f mica capacitor to 5/8". Connect one lead to lug 1 of capacitor W (S-1). Connect the other lead to terminal 1 of the VFO coil (S-4).

( ) Cut a #16 bare wire to 2-3/4". Connect one end to lug 1 of V12 (S-3). Slip a 2-1/4" length of sleeving over the bare wire and dress the wire as shown, spacing it away from the tube mounting bracket and VFO tuning capacitor. Connect the other end to terminal 2 of the VFO coil (S-1). See the insert for lead dress.

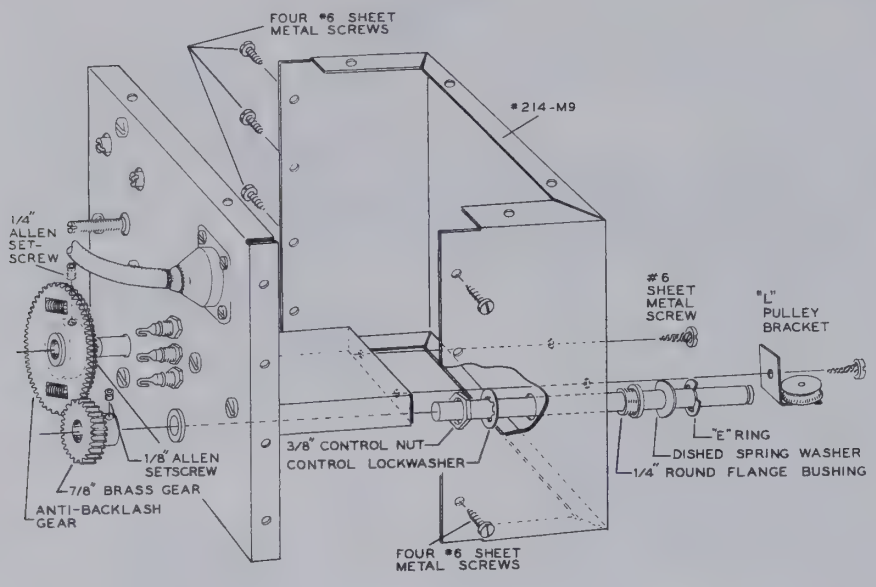
( ) Cut a length of coaxial cable to 10". Prepare both ends of the cable and install a phono connector on one end as shown in Detail 21A.

( ) Insert the 3" length of inner conductor through the coaxial shield hood. Slip the coaxial braid over the neck of the hood. Wrap a turn of bare wire around the neck of the hood over the braid. Then, solder the bare wire and braid to the hood neck. Take care not to overheat the hood and cause the inner conductor insulation to melt. See Detail 21B.



Detail 21B

( ) Insert the inner conductor through the 5/16" grommet and connect it to lug 5 of V12 (S-1).



Pictorial 22

( ) RFC-7. Cut one lead of the 1.1 mh 4-pie RF choke to 1-1/4". Cut the other lead to 1/2". Slip a 1" length of sleeving over the long lead and connect to lug 2 of V12 (S-3). Connect the other lead to FT-19 (S-2). Position the choke so that it does not touch any other components or metal parts.

This completes all wiring of the VFO. Make sure all connections are soldered and that all components are fairly rigid. Check for possible errors, shorts, etc. With an ohmmeter, check the coaxial cable for a possible short. Also check for continuity of the RF chokes and the VFO coil.

Refer to Pictorial 22 for the following steps.

( ) Locate the VFO back and side housing (#214-M9) and mount a 1/4" round flange bushing in the 3/8" hole. Use a control lockwasher and nut.

( ) Now mount the VFO back and side housing to the VFO front panel housing, starting nine #6 sheet metal screws in the holes first. Omit the screw which holds the "L" pulley bracket shown in Pictorial 22. Then, after each screw is started, secure all screws in place. Make sure the 1/4" bushing just installed lines up with the Oilite bearing.

( ) Now mount an "L" pulley bracket to the VFO housing using a #6 sheet metal screw.

( ) Locate the remaining 3-5/8" shaft with two E grooves. Place an "E" washer in the groove farthest from the end of the shaft. Slip a dished spring washer over the shaft and insert the shaft through the 1/4" bushing, then through the Oilite bearing of the VFO housing.

( ) Locate the remaining 7/8" diameter brass gear and start an 8-32 x 1/8" Allen setscrew in the hub. Place the gear on the shaft with the hub towards the Oilite bearing. Place a slight tension on the dished spring washer, by pushing the shaft and, while holding the brass gear against the Oilite bearing, tighten the Allen setscrew.

( ) Locate the anti-backlash gear and start an 8-32 x 1/4" Allen setscrew in the gear hub.

( ) Place tension on the anti-backlash gear by rotating the inside half of the gear past the other half for a distance of one tooth. While holding the tension with a screwdriver or with your fingers, slide the gear on the VFO tuning capacitor shaft with the gear hub toward the VFO housing. Position the gear teeth so they are centered in the brass gear. Tighten the Allen setscrew.

( ) Preset the VFO tuning capacitor with the plates completely closed (fully meshed).

( ) Preset trimmer capacitor V with the plates fully meshed.

( ) Preset differential capacitor W with the plates fully meshed on the side toward the tube socket.

( ) Using some form of marking (finger nail polish is ideal), mark the shafts of capacitors V and W, and on an adjacent point on the panel of the VFO housing for future reference.

This completes the VFO housing assembly.

Refer to Pictorials 23 and 24 for the following steps.

( ) Connect the black wire from the modulation transformer to lug 2 of terminal strip UU (NS).

( ) Connect the yellow-black lead from the modulation transformer to lug 1 of terminal strip UU (NS).

( ) Connect the black wire coming from grommet B to lug 2 of terminal strip UU (S-2).

( ) Connect the two brown wires coming from grommet B to lug 1 of terminal strip UU (S-3).

( ) Locate the remaining anti-backlash gear and start an 8-32 x 1/4" Allen setscrew in the gear hub.

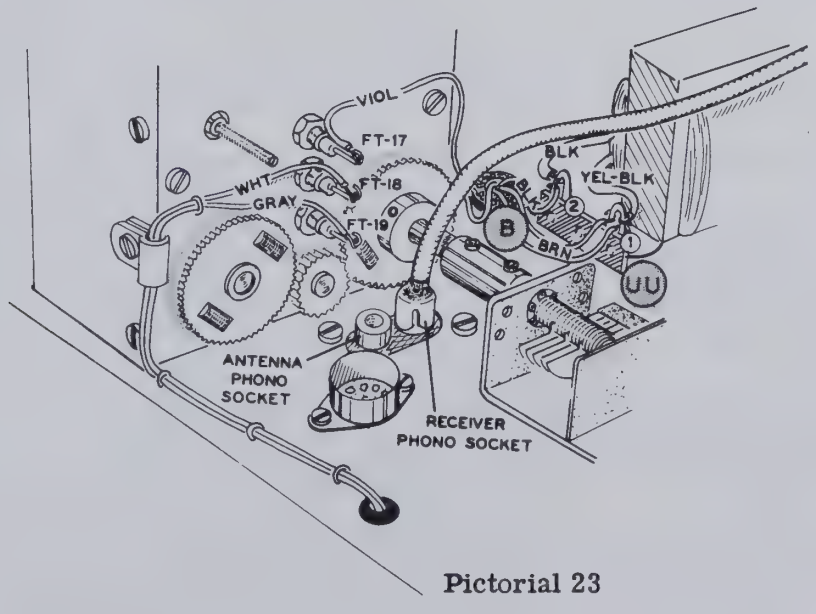
( ) Place the anti-backlash gear on the 3-gang variable capacitor shaft, with the hub toward the capacitor frame as shown in Pictorial 23. Do not tighten the setscrew yet.

( ) Mount the VFO housing on the main chassis, with the two gears near the chassis and facing toward the rear of the chassis. Position the six holes in the VFO housing flanges to line up with the six oblong holes in the main chassis. Start five #6 sheet metal screws through the oblong holes, except at location CC. See Pictorial 24. Leave the screws just loose enough so that the VFO housing can be moved the length of the oblong holes. Position the housing near the edge of the chassis.

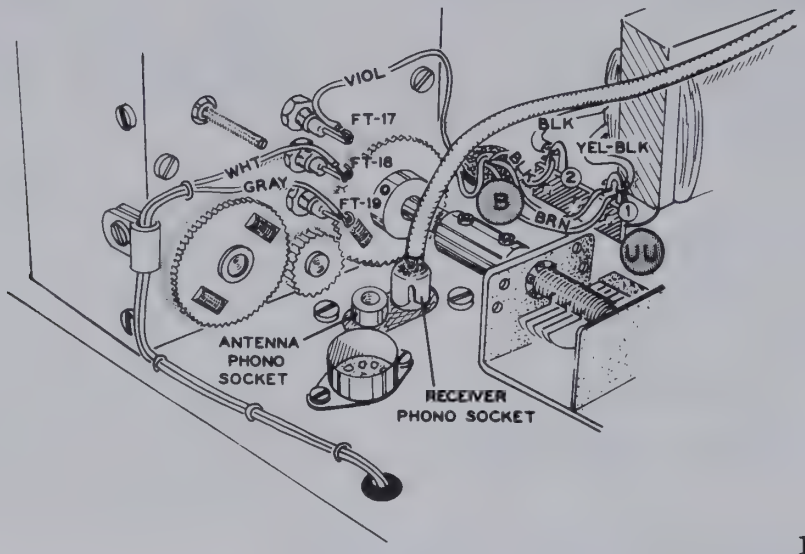
( ) Turn the main chassis over and position it as shown in Pictorial 23.

( ) With the 3-gang variable capacitor plates fully meshed and with the anti-backlash gear teeth centered in the brass gear, tighten the Allen setscrew. Make sure the gear clears the mounting screw for the double phono jack.

( ) Making sure the VFO tuning capacitor and the 3-gang variable capacitor plates are fully meshed, place tension on the anti-backlash gear by rotating the inside half of the gear past the other half for a distance of one tooth. Hold the tension with a screwdriver or with your fingers and



Pictorial 23



Pictorial 23

move the VFO housing over so that the brass gear engages the anti-backlash gear. Now tighten the five #6 sheet metal screws.

( ) Remove the second #6 sheet metal screw on the side of the VFO housing near the main chassis edge. Then dress BO#1 of the cable assembly along the chassis toward the VFO housing. Place the 1/8" plastic cable clamp over the cable assembly as shown, and secure to the VFO housing using the #6 sheet metal screw just removed. Now dress the two leads over to feed-through capacitors FT-18 and FT-19.

( ) Connect the gray wire from BO#1 to FT-19 (S-1).

( ) Connect the white wire from BO#1 to FT-18 (S-1).

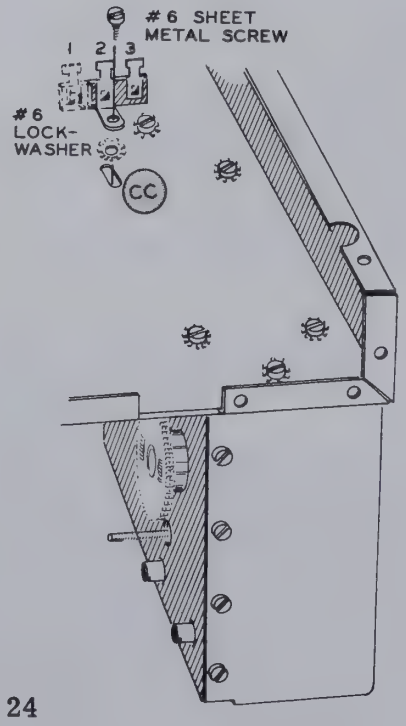
Make sure the wires are dressed so that they do not get caught in the gears.

( ) Dress the violet wire coming from grommet B up the side of the VFO housing and over to FT-17. Connect the wire to FT-17 (S-1).

( ) Dress the coaxial cable coming from the receiver subchassis as shown and plug the phono connector into the phono jack marked RECEIVER on the pictorial.

( ) Turn the main chassis over and position it as shown in Pictorial 24.

( ) Insert a #6 sheet metal screw through the mounting foot of the 3-lug miniature terminal strip. Place a #6 lockwasher over the screw and mount the terminal strip at location CC in the position shown. With a pair of diagonals, cut off the terminal strip position containing lug 1 and discard.



Pictorial 24

Refer to Pictorial 25 for the following steps.

( ) GD-2. Cut both leads of a germanium diode (#56-4, red-green-violet) to 1/2". Connect the lead from the red band end of the diode to lug 3 of terminal strip CC (NS). Connect the other lead to lug 2 of CC (S-1). Exercise care as excessive heat will damage diodes.

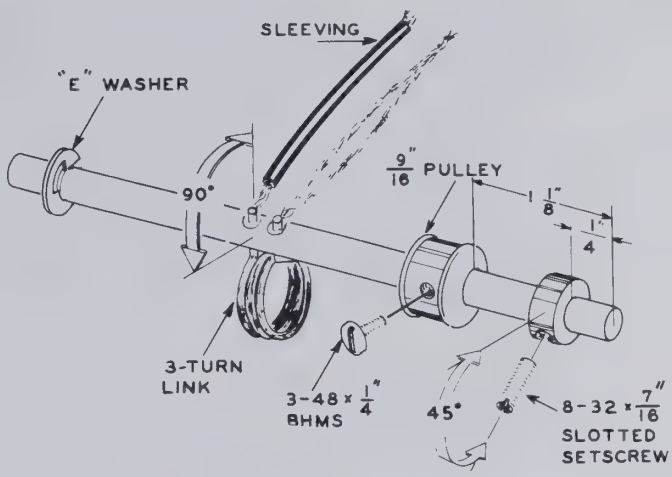
( ) Locate the remaining partition plate. Install a 1/2" rubber grommet in the 1/2" radius cutout on the bottom of the plate. Cut the bottom half of the rubber grommet off and discard.

( ) Dress all the leads in the power supply and modulator sections back in their respective sections to make clearance for the partition plate. Lift the section of cable harness which goes into the transmitter section and place it on top of the switch mounting bracket. This provides clearance for the spade bolt. Now mount the partition plate on the main chassis, dressing the cable assembly under the 1/2" grommet. Be sure that all wires are clear so that they do not get pinched when the plate is secured in place. Secure the two spade bolts from the top side of the chassis, using #6 lockwashers under 6-32 nuts. Also see Pictorial 5 on Page 35.

( ) Secure the ends of the plate to the front and rear apron of the chassis, using 6-32 hardware. NOTE: It will be necessary to loosen the 6-32 screw holding the connector lock and to move the lock slightly in order to insert the rear apron screw. When the screw is inserted through the hole, retighten the connector lock in position.

( ) Place a #6 lockwasher on a 6-32 screw and insert the screw through the transmitter shield plate flange and partition plate. Using the end wrench supplied with the kit, secure the two plates together, using a 6-32 nut.

( ) Locate the 4-9/16" phenolic shaft (#453-95) and the 3-turn link coil (#40-345). Observe that there are two small holes in the shaft. Insert the leads of the coil through these two holes with the coil turns resting against the shaft. If some difficulty arises in getting the coil leads through the holes, heat the coil leads with a soldering iron to remove any solder buildup that may be on the tinned leads. See Detail 25A.



Detail 25A

( ) Cut the 8" length of copper braid into two 4" lengths.

( ) Double one of the 4" lengths of braid and place the loop formed at the center over one of the protruding leads of the coil installed on the shaft. Now twist the braid together near the loop and solder. Avoid letting the solder flow down the length of the braid. Make sure the leads are dressed as shown before soldering.

( ) Repeat the above procedure for the other 4" length of braid connecting it to the other lead of the coil.

( ) Cut two 1-5/8" lengths of sleeving and slip one over each of the braid leads. After the sleeving is in place, tin the end of each braid lead.

( ) Insert an "E" ring washer in the E groove on the shaft.

( ) Locate the 9/16" string diameter pulley (#466-14) and start a 3-48 screw into the tapped hole of the pulley. Now place the pulley on the link coupling shaft 1-1/8" from the end as shown. Position the 3-48 screw at a 90 degree angle from the holes in the shaft and tighten.

( ) Locate the retainer bushing (#455-15) and start the 8-32 x 7/16" slotted setscrew in the bushing. Now slip the retainer bushing over the link coupling shaft and locate it 1/4" from the end. Position the bushing with the setscrew at about a 45 degree angle from the holes in the shaft. Tighten the setscrew.

( ) Locate the short dial cord loop and form a full turn loop around the 3-48 screw on the pulley, placing the knot at this position. Now place the link coupling shaft in the final amplifier section, with the pulley between the relay and terminal strip CC. String both halves of the dial cord over to the two small pulleys, then over to the dial cord shaft. Make 2-1/2 turns around the dial cord groove on the shaft as shown by the arrow.

( ) Now insert the end of the shaft into the partition plate bushing, with the 7/16" setscrew located between the 90 degree arc of the rotational stop, as shown by the dotted lines. With the setscrew resting against the rear stop, the link coupling coil should be straight up. Also the dial cord should be fairly tight.

Refer to Pictorial 26 for the following steps.

CAUTION: For the final wiring in the transmitter section, be extremely careful to avoid touching any of the dial cords with a hot soldering iron!

( ) C114. Cut one lead of a 2.2 $\mu\mu$f (red-red-white) tubular phenolic capacitor to 1". Cut the other lead to 5/8". Bend the 1" lead at a right angle close to the capacitor body. Bend the other lead at a right angle 1/4" from the end, but in the opposite direction. Connect the 5/8" lead to lug 2 of relay RL-2 (NS). Dress the capacitor down against the relay insulator as shown and connect the other lead to lug 3 of terminal strip CC, dressing the lead between the dial cords (NS).

( ) Connect the braid from the link coupling coil lead nearest the relay to lug 2 of the relay (S-2). Connect only the very end of the braid to the lug.

( ) RFC-12. Cut both leads of a 7 μh RF choke (#45-36, red dot) to 1". Connect one lead to lug 3 of terminal strip CC (S-3). Connect the other lead to FT-16, but before soldering, insert the brass tube through bushing Q on the chassis front apron, and toward the transmitter shield plate. Dress the RF choke so there is clearance for the brass tube. Now solder FT-16 (S-1).

( ) Refer back to Detail 18B on Page 67 and loosen the Allen setscrew on the 1-1/8" diameter pulley, backing the screw out at least two full turns. Holding the pulley in place, carefully start inserting the brass tube in the bushing on the transmitter shield plate and on through the pulley, shoving the short length of 1/4" shaft ahead of it. It will be necessary to apply quite a bit of pressure on the pulley against the dial cord in order to get the brass tube through the pulley bushing. Align the end of the brass tube with the edge of the pulley bushing and retighten the setscrew. There should be approximately 1/2" of the brass tube extending out from edge of shaft bushing Q on the front apron of the chassis. Discard the short length of 1/4" shaft.

( ) Cut a bare wire to 1-3/4" and connect one end to lug 3 of the double phono socket AC (S-1). Slip a 1-1/4" length of sleeving over the bare wire and connect the other end to lug 3 of relay RL-2 (S-1).

( ) Cut a second bare wire to 1-1/2" and connect one end to lug 2 of socket AC (S-1). Slip a 1-1/8" length of sleeving over the bare wire and connect the other end to lug 1 of relay RL-2 (S-1).

( ) R74. Cut both leads of the 10 KΩ (brown-black-orange) 2 watt resistor to 1". Bend both leads at right angles 1/2" from the resistor body, but in opposite directions. Connect one lead to FT-15 (S-1). Dress the resistor as shown and connect the other lead to lug 4 of relay RL-2 (S-1). Avoid using too much heat on this lug.

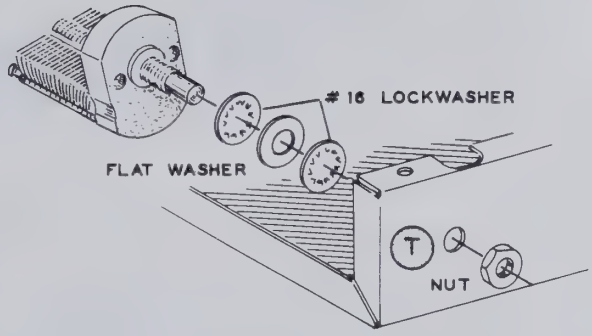
( ) Slip a 1-1/8" length of sleeving over the loose lead of the 12 KΩ 2 watt resistor and capacitor combination. Bend the lead to clear the brass tube as shown and connect it to FT-14 (NS).

( ) Locate the 6-meter final tank coil assembly (#140-26) and, referring to Pictorial 26 temporarily position the coil as shown. Center the coil over the link coupling shaft and if necessary, trim the coil leads to fit. Then flatten the ends of the coil leads with a pair of pliers in the same plane as the coil axis. See the insert on the Pictorial.

( ) Insert the coil lead ends, one in each stator lug of the butterfly capacitor. Dress the RF choke connected to the center of the coil over toward FT-14. With the coil turns resting on the link coupling shaft, solder both standoff terminals, the coil leads, the capacitor stator terminals, and the wires coming from lugs 6 and 8 of V15. Position the final tank coil so that the link coupling coil can move freely when the link coupling shaft is rotated. Make certain the link coupling coil does not short to the final tank coil during its travel.

( ) RFC-11. Cut the free lead of the RF choke connected to the final tank coil to 7/8". Dress the choke as shown and connect the lead to FT-14 (S-2).

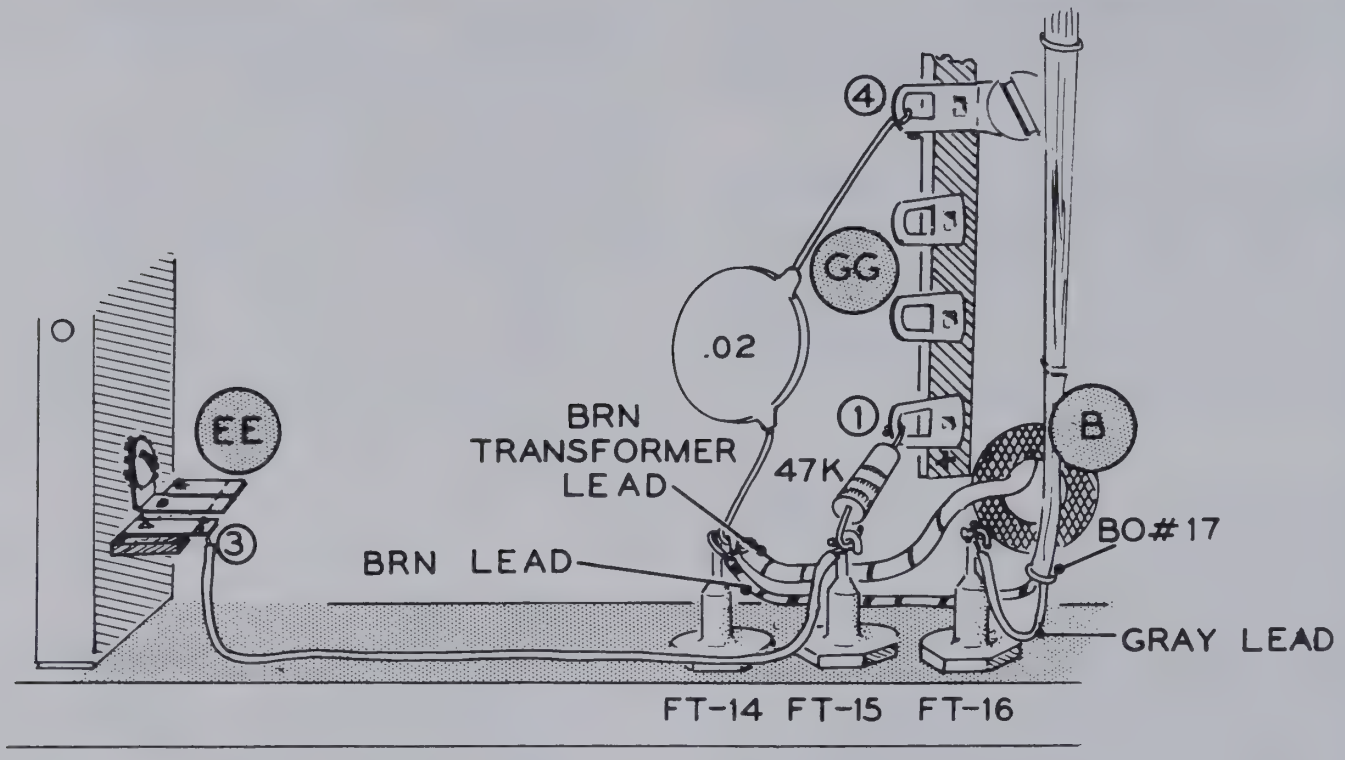
( ) C113. Locate the loading capacitor (#26-50) and the two #16 control lockwashers. Remove the flat washer and nut supplied with the capacitor, and place one of the lockwashers on the capacitor bushing. Replace the flat washer, and then place the other lockwasher on the bushing. See Detail 26A. Now mount the capacitor at location T on the front apron of the chassis in the position shown and secure with the nut supplied.



Detail 26A

( ) Connect the braid from the other link coupling coil lead to stator lug 1 of the loading capacitor (S-1).

This completes all wiring of the final amplifier section. Recheck the work, making sure all connections are correct and soldered.



Detail 26B

( ) Cut a red hookup wire to 4" and strip both ends 3/8". Referring to Detail 26B, connect one end to lug 3 of terminal strip EE (S-3). Dress the lead along the partition and connect the other end to FT-15 (NS).

( ) Connect the brown modulation transformer lead coming from grommet B to FT-14 (NS).

( ) Connect the brown lead from BO#17 to FT-14 (NS).

( ) Connect the gray lead from BO#17 to FT-16 (S-1).

( ) R44. Cut both leads of a 47 KΩ (yellow-violet-orange) resistor to 3/8". Connect one lead to lug 1 of terminal strip GG (S-4). Connect the other lead to FT-15 (S-2).

( ) C129. Cut both leads of a .02 μfd disc ceramic capacitor to 1". Connect one lead to lug 4 of terminal strip GG (S-4). Connect the other lead to FT-14 (NS).

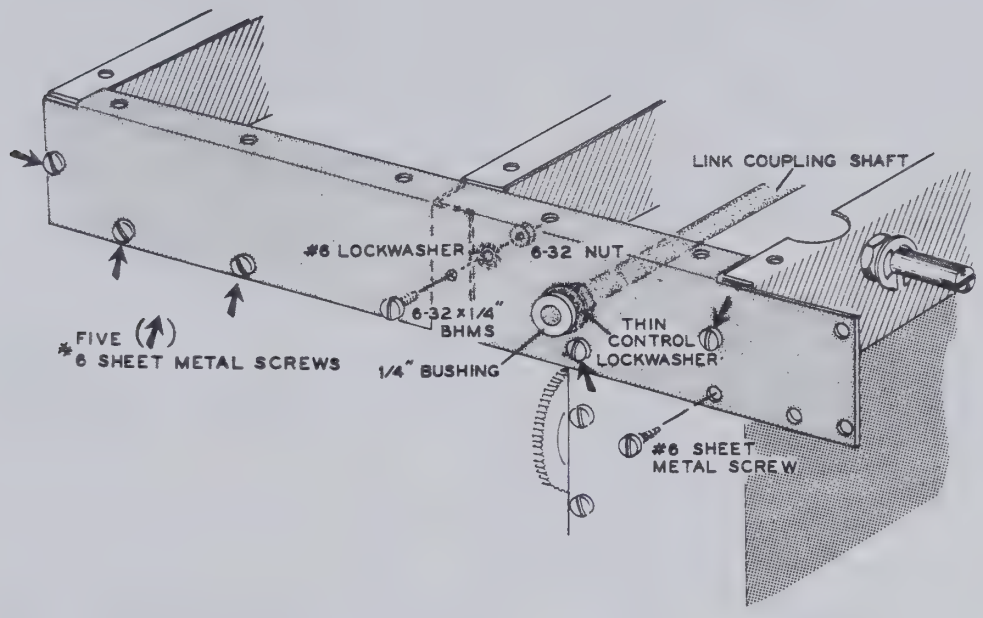
This completes all wiring on the bottom of the main chassis. All connections should be soldered except for FT-5 in the receiver subchassis and FT-14 in the modulator section. These connections will be soldered after alignment and calibration of the Transceiver.

( ) Locate the right-hand chassis end plate (#205-M251) and install a 1/4" round flange bushing from the side shown in Detail 26C. Use a thin control lockwasher and nut to secure it in place.

( ) Mount the end plate to the chassis, placing the bushing over the end of the link coupling shaft. Use five #6 sheet metal screws at the places shown.

( ) Use 6-32 x 1/4" hardware to secure the transmitter shield plate to the chassis end plate.

Now check in the transmitter compartments to make sure the #6 sheet metal screws are not shorting to any of the wires in the cable assembly or shorting to any components. Also check for possible shorts to the brass tube from wires connected on feed-through capacitors FT-14, FT-15, and FT-16.



Detail 26C

FRONT PANEL ASSEMBLY

Refer to Pictorial 27 (fold-out from Page 83) for the following steps.

( ) Locate the front panel (#100-M289F392-429) and the front panel support plate (#205-M252.

( ) Place a cloth over the work area to prevent scratching the front panel as most of the assembly is done with the panel face down.

( ) Place the front panel support plate on the front panel in the position shown.

( ) Locate the mike connector socket (#432-23) and remove the knurled nut. Tighten the hex nut against the back of the connector and install the connector in the large hole on the front panel and front panel support plate. Orient the connector with the notch toward the bottom edge of the panel and fasten it in place with the knurled nut. Do not tighten yet.

( ) R55. Locate the 10 KΩ linear control with a SPST push-pull switch (#19-60) and install it with a control solder lug at the location marked ANL/SQUELCH. Orient the solder lug and control as shown and secure with a control flat washer under a control nut.

( ) R32. Locate the 50 KΩ linear control with a SPST push-pull switch (#19-61) and install it with a control solder lug at the location marked BFO PITCH. Position the solder lug toward the RF GAIN control as shown. Secure the control with a control flat washer under a control nut.

( ) R3. Locate the 2 KΩ linear control (#10-65) and observe that it has a dummy lug. Cut this lug off. Install the control at the location marked RF GAIN. Use a thin control lockwasher between the control and panel, and secure it in place with a control flat washer under a control nut. Orient the control as shown.

( ) R29. Locate the 1 megohm audio control with the DPST switch (#19-59) and place a control solder lug on the control bushing. Install the control on the front panel at the location marked AUDIO. Use a control flat washer and nut. Orient the control and control solder lug as shown.

( ) Locate the two 1/2" long shaft bushings with a thin hex flange. Install one at the hole marked RCVR TUNE, inserting the bushing through the hole from the front side of the panel. Secure in place with a control lockwasher under a control nut.

( ) Repeat the above step, except install the other 1/2" long shaft bushing at the hole location marked XMTR TUNE.

( ) Locate the two 1-3/8" dial cord drive shafts. Place an E washer in the E groove near the center of one of the shafts. Slip a dished spring washer over the shaft with the concave side towards the E washer. Insert the shaft into the RCVR bushing from the side shown. Slip another dished spring washer over the shaft with the convex side toward the bushing flange. With pressure exerted on the dial cord groove end of the shaft, place an E washer in the other E groove on the shaft.

( ) In a like manner, install the other dial cord drive shaft in the bushing at the XMTR location.

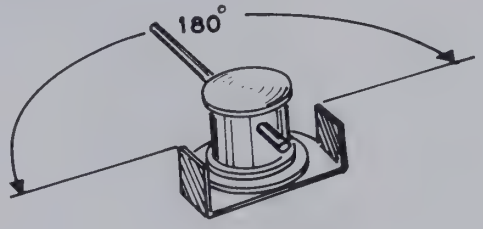
( ) Locate the remaining 1/4" round flange bushing and the remaining 180 degree rotational stop. Slip the bushing through the rotational stop and install it on the front panel at the location marked FINAL. Position the rotational stop in line with the yet unused 3/8" hole as shown and secure the bushing with a control flat washer under a control nut.

( ) Locate the 3/16" ID x 3/8" long shaft bushing (#455-28) and place a control flat washer over the bushing. Now install the bushing from the front side of the panel at the VFO, X1-X4 location. Use a control lockwasher under a control nut.

( ) Now tighten all control nuts and the mike connector making sure all parts are positioned as shown except the shaft bushing at the VFO, X1-X4 location. Leave this bushing slightly loose.

( ) Locate the brass final tuning drive shaft and insert it through the FINAL bushing from the rotational stop side. Slip a dished spring washer over the shaft end, with the convex side toward the control nut and place an E washer in the E groove on the shaft.

( ) Now insert the 3/4" roll pin through the hole of the FINAL tune shaft just installed, with 1/8" protruding through the other side. See Detail 27A. Rotate the shaft to be sure that 180 degree rotation is possible.



Detail 27A

( ) Locate a 3-lug miniature terminal strip and with a pair of diagonals, cut off and discard the terminal strip portion containing lug 1.

( ) Locate a DPDT slide switch (#60-13) and install it on the 6-32 x 1/4" weld studs at the location marked AM-CW. Also install the 3-lug miniature terminal strip as shown. Use 6-32 nuts only to secure the switch in place and try to align the flat side of the nuts in parallel with the ends of the switch.

( ) Locate the other two DPDT switches (#60-13). Bend all lugs down as shown and install one at the AVC location and the other at the SPOT location. Use 6-32 nuts only.

( ) Locate the meter (#407-74) and install it in the rectangular cutout from the front side of the panel. Insert the meter with its zero or pointer position toward the bottom edge of the panel. Secure the meter in place by using the spring clamp supplied with the meter.

( ) Place a #6 lockwasher on each of the four 6-32 x 1/2" weld studs.

( ) Locate the four 3/8" OD x 3/32" thick red fiber washers and place one on each 6-32 x 1/2" weld stud.

( ) Locate the plastic dial plate. Handle the plastic by its edges to avoid finger smudges. Remove the protective paper. Using a solution of a few drops of household detergent (Joy, Liquid Lux, etc.,) in a cup of lukewarm water, wipe over both sides of the plastic plate with a sponge or soft cloth. This will prevent static charges from collecting on the plastic that normally attracts dust particles, and will also clean any smudges that may be present.

( ) Place the plastic dial plate over the four 1/2" studs and against the window opening bevels. Looking from the front of the panel, make sure that the numbered scales are legible.

( ) Locate the four 1/16" thick fiber washers and place one on each 1/2" stud.

( ) Locate the back dial plate assembly (#100-M290F), the right angle pulley bracket (#100-M284) and the remaining L pulley bracket.

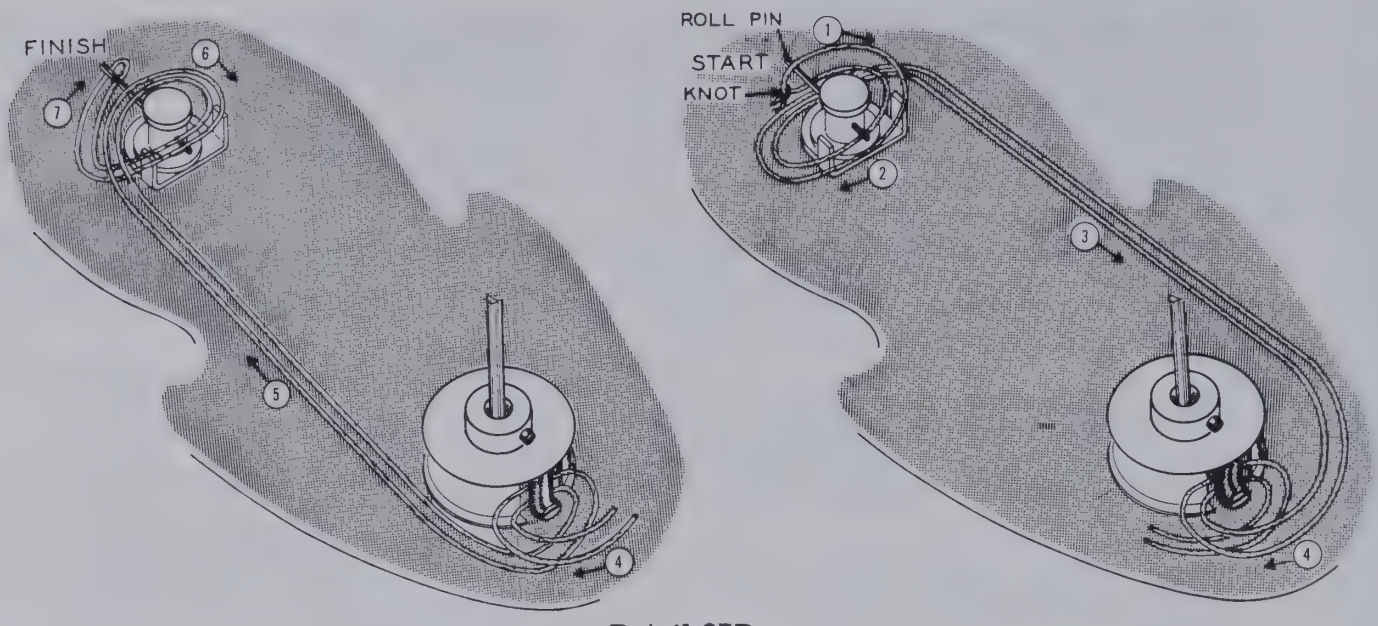
( ) Mount the L pulley bracket to the right angle pulley bracket as shown in the Pictorial. Use 6-32 x 1/4" hardware. Now mount the pulley bracket assembly to the dial back plate assembly. Use 3-48 x 1/4" hardware, inserting the 3-48 screw through the smaller hole from the painted side of the dial back plate as shown. Be sure the two larger holes are lined up before tightening the nut.

( ) Now place the dial back plate over the 1/2" studs, with the black painted side toward the plastic. Be sure the pulley bracket assembly just installed is on the meter end of the front panel. Also check for any switch lugs that may touch the back plate.

( ) Place a #6 lockwasher over three of the 1/2" studs as shown.

( ) Locate the four 9/16" long phenolic spacers and observe that one end is tapped for a 6-32 thread. Install the spacers, one on each of the 1/2" studs, but do not overtighten.

( ) Locate the two pilot lamp sockets and install a pilot lamp in each socket. Referring to the Pictorial, mount the pilot lamp sockets on the phenolic spacers with the bent socket lug over the spacer located near the top edge of the front panel. Place a #6 small solder lug over each of the four 3-48 x 1/4" screws, then a #3 lockwasher and secure the sockets to the spacers by fastening the screws in the 3-48 thread of the spacers. Position the solder lugs as shown.



Detail 27B

( ) Locate the other 1-1/4" diameter dial pulley and slip a short length of small insulating sleeving over the tab in the pulley rim, then cut off the sleeving flush with the edge of the tab.

( ) Locate the remaining dial cord loop, and form the loop with the knot at one end as shown in Detail 27B. Place this end of the loop over the long end of the roll pin in the FINAL TUNE shaft. Following the numbered arrows, go around the shaft one complete turn under both ends of the roll pin. Now place the other 1-1/4" diameter dial pulley over the VFO, X1-X4 shaft bushing, with the pulley hub up and the tab in the rim of the pulley toward the bottom edge of the panel as shown. Continue with the dial cord around the pulley rim, then make a full turn loop around the tab on the pulley. (It will be necessary to lift the pulley up off the front panel to place the dial cord around the tab, but keep the pulley in the same relative position.) Continue on around the pulley and back to the shaft. Now make another complete turn around the shaft but on top of both roll pin ends, dressing the loop end under the dial cord from the pulley to the shaft. Move the pulley toward the shaft, keeping the dial cord in place, and slip the loop end over the longer end of the roll pin. Now return the pulley back over the shaft bushing and insert the 3/16" diameter x 8" shaft through the pulley and into the VFO, X1-X4 bushing. This will keep the pulley in position until the front panel is mounted to the main chassis.

( ) Start an 8-32 x 1/4" Allen setscrew in the hub of the pulley.

This completes assembly of the front panel. Check to be sure that all controls are mounted in their proper locations and that the plastic dial plate is legible. Check for clearance of the pilot lamps in the back dial plate cutouts to avoid any possible short circuits of the base of the lamps to the plate. Also check for clearance between the bottom edge of the back dial plate and the two control solder lugs. Make certain the setscrew in the pulley is toward the bottom edge of the panel.

FRONT PANEL WIRING

Refer to Pictorial 28 for the following steps.

( ) Position the main chassis with the front toward you. Now place the front panel in front of the chassis, face down with the top edge toward you.

( ) Locate the 3/16" plastic cable clamp and slip it over the cable assembly of BO#20. Dress the cable along the front apron near the top edge of the chassis, then form a right angle bend at the end plate. Mount the plastic cable clamp on the inside of the end plate, using 6-32 hardware.

( ) Cut off lug 4 of slide switch SW-3.

( ) Cut a black hookup wire to 2" and strip both ends 3/8". Connect one end to lug 5 of SW-3 (S-1). Connect the other end to lug 2 of the terminal strip mounted at SW-2 (NS).

( ) Cut another black hookup wire to 2" in length and strip both ends 3/8". Connect one end to lug 2 of SW-2 (S-1). Connect the other end to lug 2 of the terminal strip (NS).

( ) Cut a third black hookup wire to 2-3/8" and strip both ends 3/8". Connect one end to solder lug 2 of pilot lamp PL-2 (S-1). Dress the wire as shown and connect the other end to lug 2 of the terminal strip (S-3).

( ) Cut a red hookup wire to 4-1/2" and strip both ends 3/8". Slip a 1/2" length of sleeving over one end and connect this end to lug 1 of SW-3 (S-1). Now slip the sleeving over the soldered lug. Dress the wire as shown and connect the other end to lug 5 of SW-2 (NS).

Connect the three short leads from BO#20 to slide switch SW-3 as follows:

( ) Slip a 1/2" length of sleeving over the red lead and connect it to lug 2 (S-1). Now slip the sleeving over the lug.

( ) Connect the short gray lead to lug 6 (S-1).

( ) Connect the orange lead to lug 3 of the terminal strip (NS).

Connect the four long leads from BO#20 to slide switch SW-2 as follows:

( ) Connect the gray lead to lug 3 (S-1).

( ) Connect the black lead to lug 1 (S-1).

( ) Connect the yellow lead to lug 5 (S-2).

( ) Connect the brown lead to lug 4 (S-1).

Lug 6 on SW-2 is not used.

( ) Cut both leads of a 33 KΩ (orange-orange-orange) resistor to 3/4". Connect one lead to lug 3 of SW-3 (S-1). Connect the other lead to lug 3 of the terminal strip (S-2).

( ) Cut a black hookup wire to 4" and strip both ends to 3/8". Connect one end to lug 5 of SW-4 (S-1). Dress the wire down on the panel and connect it to the control solder lug of RC-2 (NS).

( ) Cut a red hookup wire to 5-1/4" and strip both ends 3/8". Connect one end to lug 2 of SW-4 (NS). Dress the wire down on the panel and close to the meter as shown. Connect the other end to the (+) terminal of the meter. CAUTION: Do not use excessive heat on the meter terminals (S-1). The (+) terminal should be toward the top edge of the front panel.

( ) Dress the black and white twisted pair as shown and connect the black wire to solder lug 2 of PL-1 (S-1). Connect the white wire to solder lug 1 of PL-1 (NS).

( ) Cut a white hookup wire to 8-3/4" and strip both ends 3/8". Connect one end to solder lug 1 of PL-2 (S-1). Connect the other end to solder lug 1 of PL-1 (NS).

( ) Dress BO#19 as shown and connect the four short leads to slide switch SW-4 as follows:

( ) Connect the gray lead to lug 6 (S-1).

( ) Connect the yellow lead to lug 3 (S-1).

( ) Connect the red lead to lug 2 (S-2).

( ) Connect the green lead to lug 4 (S-1).

( ) Connect the long violet lead from BO#19 to the (-) meter terminal (S-1). Dress the lead down on the panel as shown.

( ) Insert a short length of bare wire through lug 2 of RC-3 (NS) and connect the end to lug 1 of RC-3 (NS). Connect the other end to the control solder lug of RC-2 (NS). Now solder lug 1 (S-1), lug 2 (S-2) and the control solder lug (S-2).

( ) Insert a length of bare wire through lug 4 (NS) then through lug 1 (NS) and connect the end to the control solder lug of RC-4 (NS). Solder lug 4 (S-1) and lug 1 (S-2).

( ) Insert a length of bare wire through lug 4 (NS), then through lug 1 (NS) and connect it to the control solder lug of RC-1 (NS). Solder lug 1 only (S-2).

( ) R31. Cut both leads of the remaining 2.2 megohm (red-red-green) resistor to 1/2". Bend both leads at right angles close to the resistor body but in opposite directions. Connect one lead to lug 3 (S-1) and the other lead to lug 5 (NS) of RC-2.

Connect the leads from BO#18 as follows:

( ) Connect the gray lead to lug 3 of RC-3 (S-1).

( ) Connect the white lead to lug 2 of RC-2 (S-1).

( ) Connect the blue lead to lug 5 of RC-2 (S-2).

( ) Connect the violet lead to lug 4 of RC-2 (S-1).

( ) Connect the orange lead to lug 2 of RC-1 (S-1).

( ) Connect the yellow lead to lug 3 of RC-1 (S-1).

( ) Connect the two short black leads to lug 4 of the mike connector socket (S-2).

( ) Cut a bare wire to 4-1/4". Insert one end through lug 3 (NS) and connect it to lug 1 (S-1) of the mike connector. Solder lug 3 (S-2). Slip a 2-3/4" length of sleeving over the bare wire and connect the other end to the control solder lug of RC-4 (NS).

( ) R33. Cut both leads of a 150 KΩ (brown-green-yellow) resistor to 1/2". Connect one lead to lug 1 of RC-2 (S-1). Connect the other lead to the control solder lug of RC-1 (S-2).

( ) Connect the inner conductor of the short audio cable coming from grommet F to lug 3 of RC-4 (S-1). Connect the outer shield to the control solder lug of RC-4 (NS).

( ) Connect the inner conductor of the long audio cable coming from grommet F to lug 5 of RC-1 (S-1). Connect the outer shield to lug 4 of RC-1 (S-2).

Check all wiring at this point. All connections should be soldered except for solder lug 1 of PL-1 and control solder lug of RC-4. Lug 6 of SW-2 and lug 1 of SW-4 are not used. Lug 4 of SW-3 is cut off and not used. Connections to lugs 2, 5, 6, and 7 of RC-4 and lug 2 of the mike connector socket will be made later.

Refer to Pictorial 29 for the following steps.

( ) Locate the longer length of dial cord with the eyelets attached and place the center of the dial cord around idler pulley #3 as shown in Pictorial 29. Dress the two ends toward the idler pulley bracket assembly and tie the cord to the bracket with a single knot to hold it in place. Stringing of the cord will be finished when the panel is in place.

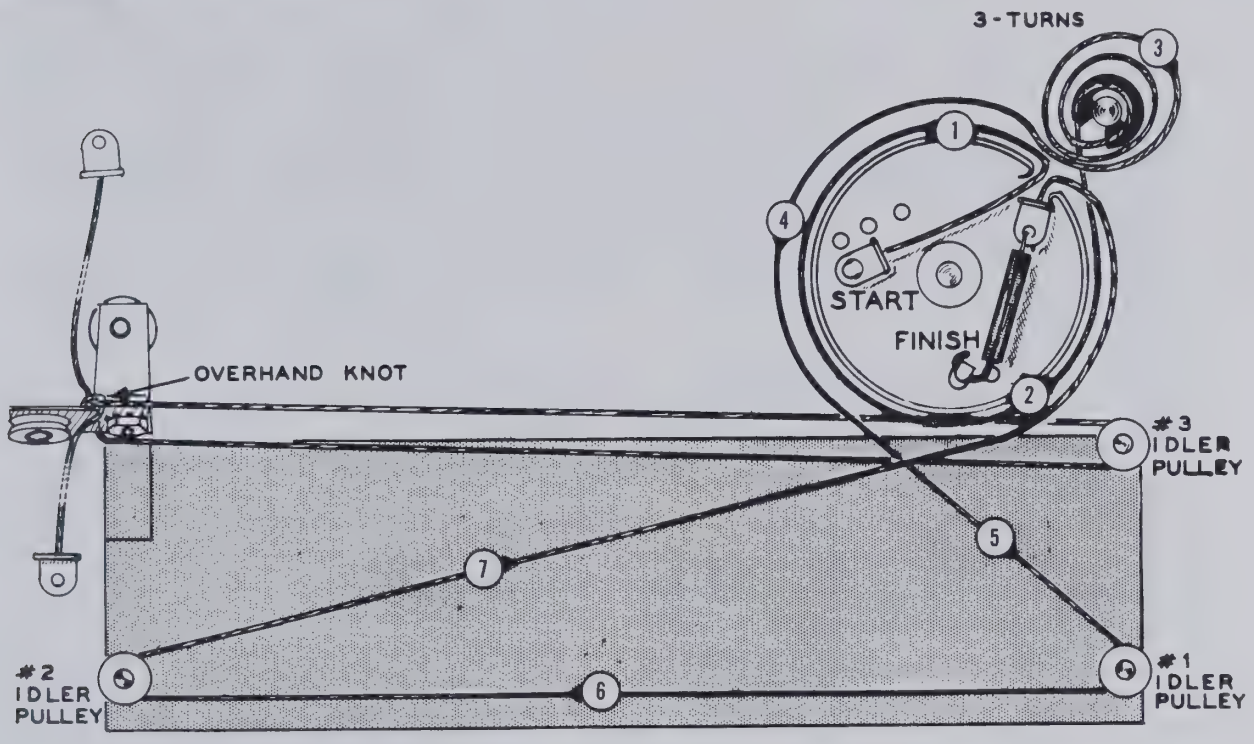
( ) Locate a large dial pulley and start an 8-32 x 1/4" Allen setscrew in the pulley hub. Place the pulley on the front panel in the position shown. (The pulley is only placed on the panel and does not mount on any shaft as yet.)

( ) Locate the other length of dial cord with eyelets attached. Study Pictorial 29 and observe how the dial cord is to be strung.

( ) Locate the dial cord spring and open both end hooks slightly.

( ) Take the dial cord and place the eyelet of one end over the hook on the dial pulley marked START, as shown.

( ) Following the consecutively numbered arrows, pass the cord out through the pulley rim opening and go around the pulley rim one complete turn while holding the pulley in place with one hand. Then make three complete turns around the dial cord drive shaft and again go around the pulley rim in the same direction as before. Now dress the dial cord around idler pulley #1, then over to idler pulley #2, and then back to the large pulley. Pass the other eyelet through the rim opening and hook the dial cord spring on the eyelet. Using a pair of long-nose pliers, hook the other end of the spring in the other hook on the dial pulley marked FINISH. After the spring is in place, it will not be necessary to hold the dial pulley in place.



Pictorial 29

( ) Move the main chassis until both end plates are over the edge of the work area. Hold the panel up slightly to keep strain off of the cable assembly leads and also keep the 3/16" diameter shaft from falling out of the panel. Allow the 3/16" diameter shaft to slip through the bushing until about 1/4" is protruding beyond the final tune pulley hub.

( ) Now, place the front panel in an upright position, positioning the panel until the large dial pulley hub lines up with the VFO drive shaft. Push the panel forward until the pulley slips over the VFO shaft and at the same time, shove the 3/16" diameter shaft into the brass tube about half way. Fasten the front panel to the main chassis end plates, using four #6 sheet metal screws. See Pictorial 30 on Page 91.

( ) At BO#20 of the cable assembly, dress these leads back inside the panel edge. Also dress the two audio cables back against the panel.

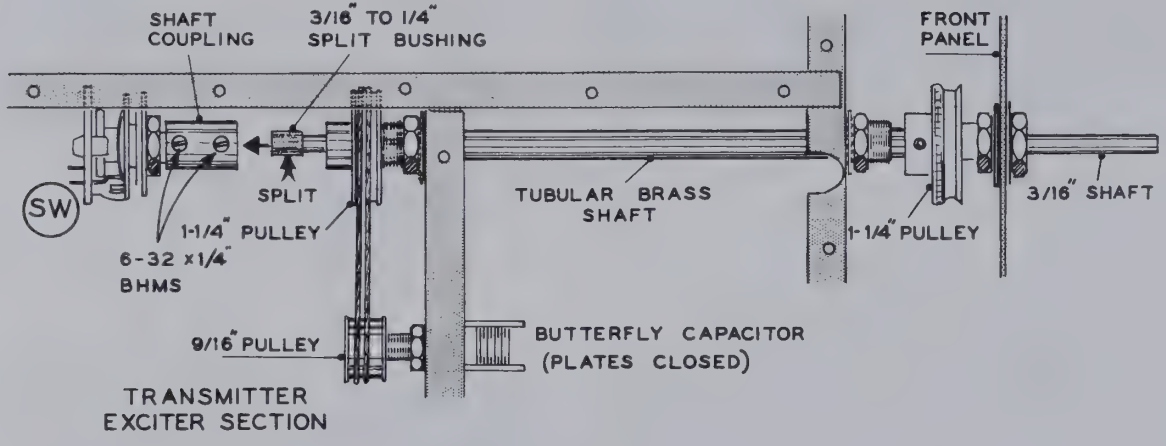
( ) Start an 8-32 x 1/4" Allen setscrew into one of the larger knobs, and temporarily install on the XMTR TUNE shaft.

( ) Rotate the knob approximately 2 turns in a clockwise direction until the rim opening in the large pulley is toward the right-hand edge of the front panel.

( ) Now rotate the VFO anti-backlash gear with your fingers until the exciter 3-gang tuning capacitor plates are full open (completely unmeshed).

( ) Position the large pulley on the VFO drive shaft so that the pulley rim is in line with the dial cord groove on the XMTR TUNE shaft. There should be at least 3/16" clearance between the large pulley and the dial back plate. Also the pulley should just clear lug 1 of the SPOT switch (SW-3). If the pulley is rubbing on this lug, bend the lug down farther until obvious spacing can be seen between it and the pulley. Now tighten the Allen setscrew.

( ) Rotate the dial mechanism three or four complete turns to work any slack out of the dial cord. If slippage results on the XMTR TUNE shaft, check the spring for tension. Also check to see if the dial cord has "walked over" in the dial cord groove on the shaft. If this has happened the large



Detail 29A

pulley is too far back. It will be necessary to move it toward the front panel, making sure the pulley rim lines up with the groove in the shaft. Now rotate the dial mechanism until the 3-gang tuning capacitor plates are closed.

( ) Locate a dial pointer and slip it on the top edge of the back dial plate. The pointer should be between the plastic plate and the back dial plate.

( ) Position the pointer so that it is in line with the calibration mark located under the top bevel of the window opening on the left-hand end of the dial plate (transmitter dial section). See Pictorial 31 on Page 93. Slip the dial cord between the center tab and the two end tabs, and bend the center tab against the dial cord just enough so that the dial pointer will move when the dial mechanism is rotated.

( ) Rotate the dial mechanism, turning the knob clockwise (the pointer should move upscale) until the pointer stops. The pointer should stop in line with the right-hand calibration mark. When the upper and lower positions of the dial pointer are set, bend the center tab of the pointer tightly against the dial cord. (Be careful to avoid cutting the cord.) Place a drop of glue, cement, or nail polish on the three pointer tabs to hold the dial cord in place.

( ) Now remove the knob from the XMTR TUNE shaft and install on the RCVR TUNE shaft.

( ) Place the main chassis on its right-hand side so the bottom is toward you.

( ) Refer to Detail 29A and slip the final tune pulley, located between the front panel and front apron of the chassis, over the brass tube. Be sure the Allen setscrew is backed out and will not interfere with slipping the pulley on. It may be necessary to use a large pair of pliers to pull the pulley against the dial cord in order to slip it on the brass tube. When the pulley is in place, shove the brass tube forward until the two pulley rims in the exciter section of the transmitter are in line.

( ) Start an 8-32 x 1/8" Allen setscrew in one of the small metal knobs. Temporarily install the knob on the FINAL TUNE shaft and tighten the setscrew.

( ) Turn the knob counterclockwise until the roll pin hits the stop. Check the final tuning butterfly capacitor plates for full mesh. The 3-48 screwhead on the final capacitor pulley should point toward FT-20 with the plates closed. See Detail 18B on Page 67. With the capacitor plates and pulley in this position, tighten the Allen setscrew in the final tune pulley near the front panel. Check alignment of pulley rim so there is no interference with the dial string.

( ) Rotate the FINAL TUNE knob a few times to make sure the final butterfly capacitor turns freely. Observe that for a 180 degree rotation of the knob, the capacitor should rotate 90 degrees (plates meshed to unmeshed).

( ) Locate the other metal shaft coupling and start two 6-32 x 1/4" BHMS in the coupling.

( ) Slip the coupling over the VFO-Crystal switch shaft as far as it will go and tighten the setscrew.

( ) Locate a 3/16" to 1/4" split bushing and slip it into the other end of the coupling with the slot on the bushing at 90 degrees from the setscrew.

( ) Now shove the 3/16" diameter shaft into the split bushing in the coupling as far as it will go. There should be approximately 3/8" of the shaft protruding from the front panel. Now tighten the other setscrew in the coupling. If some difficulty is experienced in getting the shaft into the coupling, loosen the two 6-32 screws holding the VFO-Crystal switch bracket in place and shift the bracket until the shaft slides into the coupling without difficulty. Then retighten the two bracket screws.

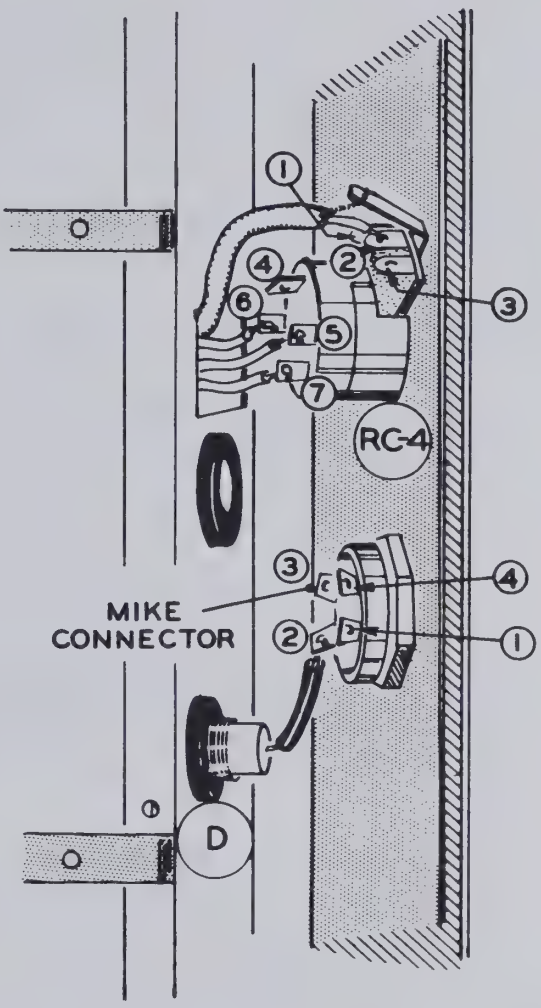
NOTE: In the next five wiring steps, when a connection is made, do not crimp the lead to the lug. Just insert the lead in the lug hole and make a good solder connection. The reason for this is for easy removal of the front panel, if necessary at some future time.

Refer to Detail 29B for the following steps.

( ) Slip a 3/4" length of sleeving over the free lead from the RF choke in grommet D on the front apron of the chassis. Connect this lead to lug 2 of the mike connector socket (S-1). Clip off the excess lead.

( ) Remove the short length of audio cable from the rectangular hole in the front apron and place to one side.

( ) Locate the two stranded black wires that were stripped and tinned, protruding through the rectangular cutout on the front apron. Connect one of these wires to lug 6 of RC-4 (S-1). Connect the other wire to lug 7 of RC-4 (S-1).



Detail 29B

( ) Locate the unstripped stranded black wire at the same location. Strip this wire 1/4" and connect it to lug 5 of RC-4 (S-1).

( ) Dress the short audio cable back through the rectangular cutout and connect the inner conductor to lug 2 of RC-4 (S-1). Connect the outer shield to the control solder lug of RC-4 (S-4).

This completes all wiring to the front panel, except solder lug 1 of PL-1 is not soldered yet.

METER CIRCUIT WIRING

Refer to Detail 29C for the following steps.

( ) Position the main chassis upright with the left side toward you.

( ) Slip the 3" length of 1/4" sleeving over the six leads of BO#14 protruding from grommet C. See Detail 29C.

( ) Connect the short red lead to lug 1 of terminal strip RR (NS).

( ) Connect the two long red leads to lug 5 of terminal strip RR (NS).

( ) Connect the green lead to lug 2 of terminal strip SS (NS).

( ) Connect the two gray leads to lug 1 of terminal strip SS (NS).

( ) R39. Cut both leads of the 39 KΩ (orange-white-orange) resistor to 3/8". Connect one lead to lug 3 of RC-5 (S-1). Connect the other lead to lug 3 of terminal strip RR (S-1).

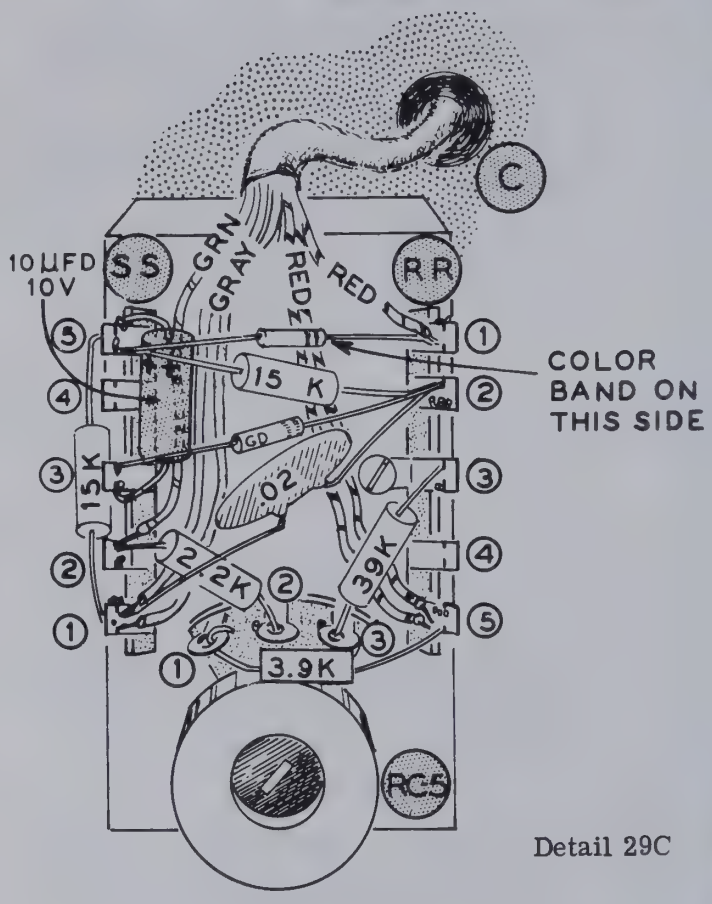
( ) R38. Cut both leads of the 2.2 KΩ (red-red-red) resistor to 3/8". Connect one lead to lug 2 of RC-5 (S-1). Connect the other lead to lug 2 of terminal strip SS (S-2).

( ) R37. Cut both leads of the 3.9 KΩ (orange-white-red) resistor to 1/2". Connect one lead to lug 1 of RC-5 (S-1). Connect the other lead to lug 5 of terminal strip RR (S-3).

( ) C120. Cut both leads of the 10 μfd 10 volt electrolytic capacitor to 1/2". Connect the positive (+) lead to lug 5 of terminal strip SS (NS). Connect the other lead to lug 3 of SS (NS). Position as shown.

( ) SD-1. Cut both leads of a silicon diode (red-red-blue) to 5/8". Connect the lead from the red color band end to lug 1 of terminal strip RR (S-2). Connect the other lead to lug 5 of terminal strip SS (NS).

( ) R46. Cut both leads of a 15 KΩ (brown-green-orange) resistor to 5/8". Connect one lead to lug 2 of terminal strip RR (NS). Connect the other lead to lug 5 of terminal strip SS (NS).



Detail 29C

( ) GD-1. Cut both leads of a germanium diode (red-green-violet) to 3/4". Connect the lead from the red color band end to lug 2 of terminal strip RR (NS). Connect the other lead to lug 3 of terminal strip SS (S-2).

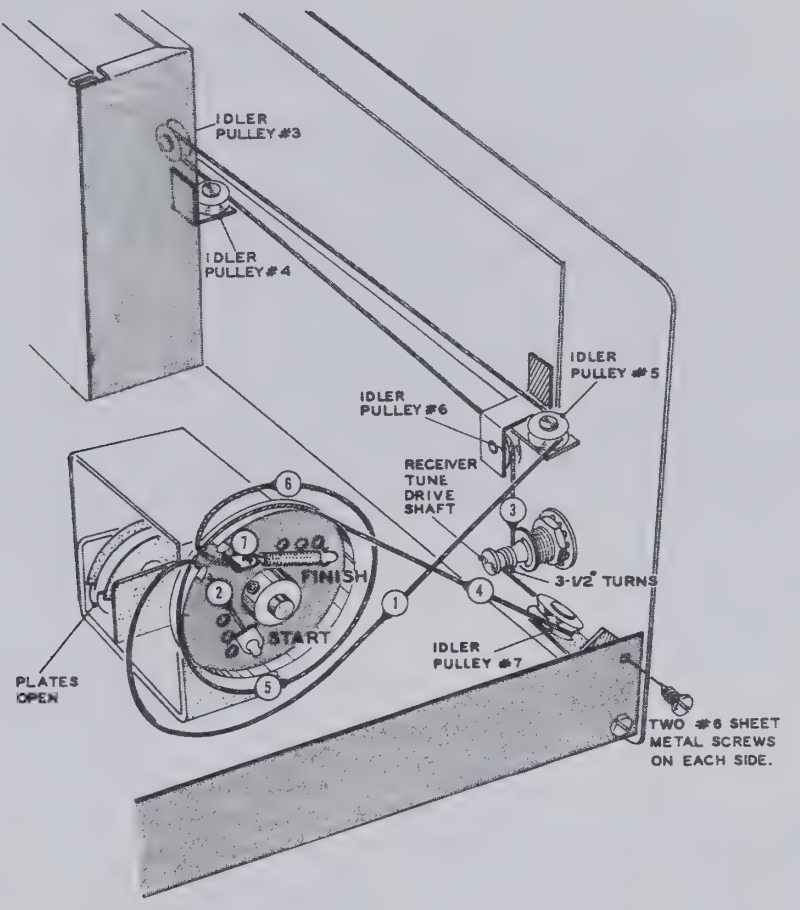
( ) R45. Cut both leads of the remaining 15 KΩ (brown-green-orange) resistor to 5/8". Connect one lead to lug 1 of terminal strip SS (NS). Connect the other lead to lug 5 of terminal strip SS (S-4). Dress the resistor as shown.

( ) C62. Cut both leads of the remaining .02 μfd disc ceramic capacitor to 7/8". Connect one lead to lug 2 of terminal strip RR (S-3). Connect the other lead to lug 1 of terminal strip SS (S-4).

This completes wiring of the meter circuit. All connections should be soldered with lugs 4 on both terminal strips RR and SS not used.

RECEIVER DIAL CORD STRINGING

Refer to Pictorial 30 for the following steps.



Pictorial 30

( ) Start an 8-32 x 1/4" Allen setscrew in the remaining large dial pulley.

( ) With the receiver 3-gang variable capacitor plates fully open (unmeshed), install the large dial pulley on the drive shaft, with the opening in the rim positioned as shown. Place the pulley hub against the brass gear and tighten the setscrew.

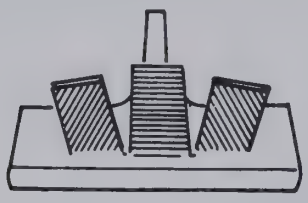
( ) Locate the other dial cord spring and open both end hooks slightly.

( ) Untie the dial cord from the idler pulley bracket assembly. Locate the end of the cord that comes from the top of idler pulley #3 and string this cord around idler pulley #5, then around the bottom of the large dial pulley. Pass the eyelet through the rim opening and place it over the hook on the dial pulley marked START. Now pull on the other end of the dial cord to remove any slack, keeping the cord on the idler pulleys.

( ) Following the consecutively numbered arrows, string the other end of the dial cord past idler pulley #4, then around idler pulley #6, down to the RECR TUNE dial cord drive shaft, making 3-1/2 turns in the direction shown around the shaft. Positioning the main chassis with this corner over the edge of the work area will aid in being able to string the cord around the shaft. Now string the cord around idler pulley #7, then up around the top of the large dial pulley, making one complete turn around the pulley. Pass the eyelet through the rim opening and hook the dial cord spring on the eyelet. If the dial cord at this point appears to be too short, rotate the RECR TUNE knob in a clockwise direction while pulling on the dial cord. This will remove any slack in the dial cord and should allow the eyelet to just pass through the rim opening. Using a pair of long-nose pliers, hook the other end of the spring in the other hook on the dial pulley marked FINISH.

( ) Rotate this dial mechanism three or four complete turns to work out any remaining slack in the dial cord. It may be necessary to bend idler pulley bracket #6 slightly toward the front panel to allow the dial cord to run smoothly on the receiver tune drive shaft. See Pictorial 30.

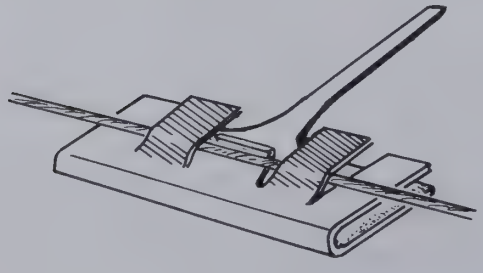
( ) Locate the other dial pointer and with a knife edge move the two outer tabs away from the center tab toward the dial pointer edges as shown in Detail 30A. This is to allow room for the end tabs so that they can be moved past the center tab.



Detail 30A

( ) Slip the dial pointer on the bottom edge of the back dial plate with the pointer between the plastic plate and back plate. The easiest place to install the pointer is between the RF GAIN control and the idler pulley bracket assembly. It will be necessary to hold the dial pointer in place until the dial cord is fastened to the pointer.

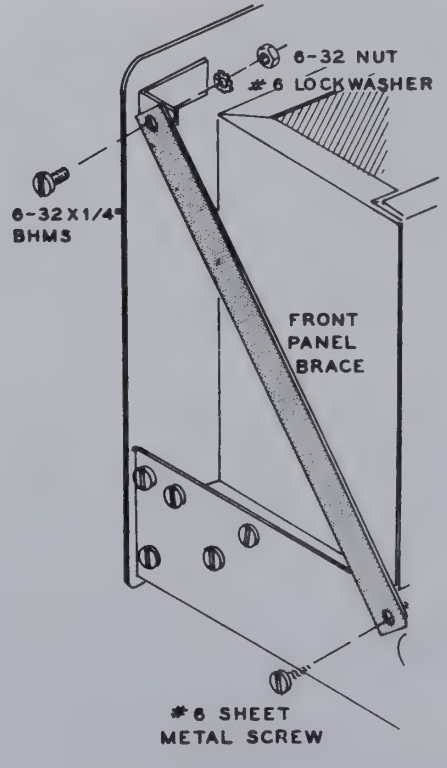
( ) Position the pointer so that it is in line with the calibration mark located under the bottom bevel of window opening (receiver dial section). See Pictorial 31. Slip the dial cord between the center tab and the two end tabs, then bend the center tab down against the dial cord until it is perpendicular to the dial pointer body. Now bend the two end tabs up and around the dial cord so they are parallel with the back dial plate. Cut off the center tab close to the two end tabs. See Detail 30B.



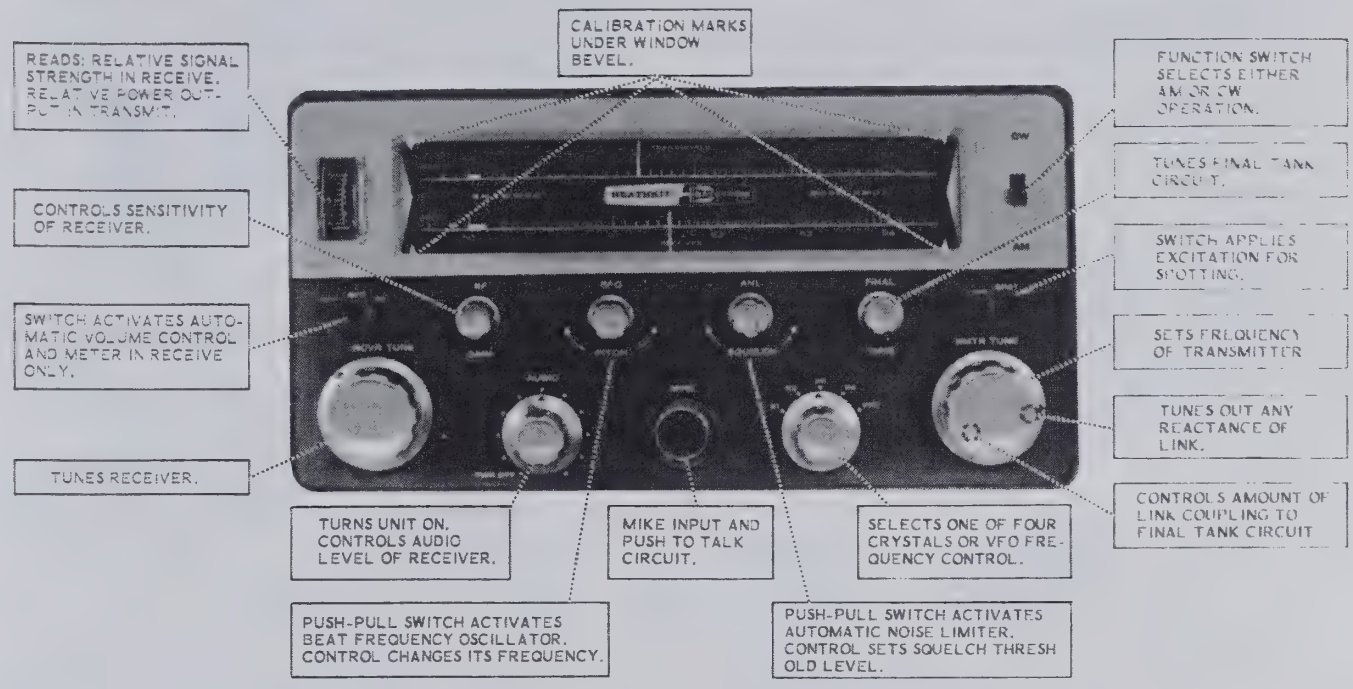
Detail 30B

( ) Rotate the dial mechanism, turning the knob clockwise (the pointer should move upscale). Make sure the dial pointer has clearance between the back dial plate and idler pulley #4 and the large transmitter dial pulley. It may be necessary to bend the idler pulley down a few degrees to clear the pointer. The pointer should stop in line with the last calibration mark upscale. When the upper and lower positions of the dial pointer are set, place a drop of glue, cement, or nail polish on the three pointer tabs to hold the dial cord in place.

( ) There may be binding in some of the shafts and squeaking of the idler pulleys. Using a very light machine oil (3-in-one is an ideal oil), apply a small drop on all shaft bushings and idler pulleys. CAUTION: Do not get oil on the dial cord grooves of those shafts that are used to drive dial cords, as slippage will result. A suggested method of applying the oil is to place the oil on the end of a small screwdriver, length of left over hookup wire or toothpick, then use the end of the small screwdriver, etc., to place the drop of oil at the desired point to be lubricated.



Detail 30C



Pictorial 31

( ) Locate the two front panel support braces (#205-M276). Mount the braces, one on each side, from the front panel side brackets to the main chassis. See Detail 30C. Use 6-32 x 1/4" hardware at the front panel brackets and #6 sheet metal screws at the main chassis to secure the braces in place. Be sure the front panel is square to the chassis.

Refer to Pictorial 31 for the following steps.

( ) Tighten the shaft bushing at the position marked X1-X4, VFO on the front panel.

( ) Start an 8-32 x 1/4" Allen setscrew in each of the two medium-sized knobs.

( ) Insert the other split bushing in one of the knobs placing the slot of the bushing 90 degrees away from the setscrew. Make sure the X1-X4, VFO switch is in its extreme counterclockwise position. Now install the knob on the X1-X4, VFO shaft with the pointer toward the X1 position. Tighten the setscrew.

( ) Install the other medium-sized knob on the AUDIO control shaft with the pointer toward the PWR OFF position making sure the control is in the extreme counterclockwise position.

( ) Secure the large knob at the RCVR TUNE position, using a second 8-32 x 1/4" Allen setscrew.

( ) Locate the three remaining small metal knobs and start an 8-32 x 1/8" Allen setscrew in each. Install the three knobs on the RF GAIN, BFO PITCH, and ANL/SQUELCH control shafts. With the three controls at midrange, position the pointers on the knobs straight up and tighten the setscrews.

( ) With the FINAL TUNE shaft in its extreme counterclockwise position, position the pointer on this knob toward the ANL/SQUELCH knob.

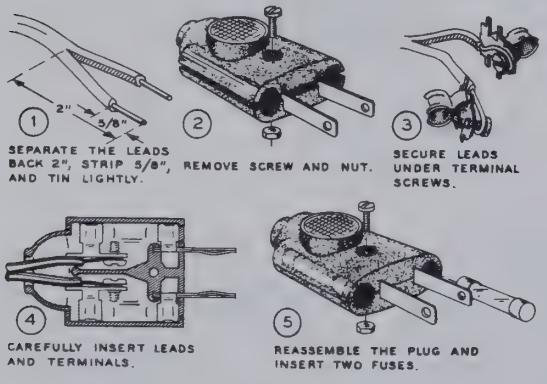
( ) Install the black plastic knob on the MOD. LEVEL control shaft protruding from the rear apron. A slotted head setscrew is already started in this knob.

The XMTR TUNE knob is left off until after transmitter adjustments are made.

WIRING OF AC POWER CONNECTOR AND PLUG

Refer to Detail 31A for the following step.

( ) Install the fused plug on one end of the line cord as follows: Open the plug to expose the screw terminals. Split the line cord approximately 2" back from the end and separate the leads. Strip each lead 5/8" and tin. Position the cord in the "bell" of the plug as shown in Detail 31A and run the leads along the separate channels provided. Connect the wires to the screw terminals with a hook in the same direction as the screw rotation when tightening. Reassemble the plug and install two 1-1/2 ampere 3AG fuses.



Detail 31A

Refer to Detail 31B for the following steps.

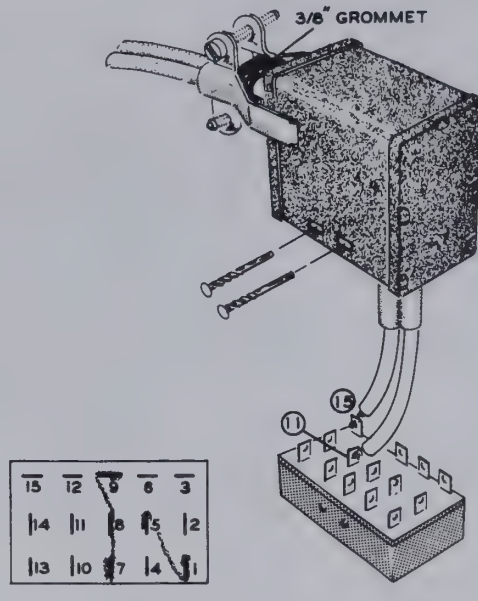
( ) Locate one of the power connector sockets and remove the two pins holding the housing to the connector socket. Use a small center punch to drive the two pins out.

( ) Referring to Detail 31B, connect a short length of braid from lug 1 (S-1) to lug 5 (S-1).

( ) Connect a second short length of braid from lug 7 (S-1), placing it next to lug 8 (S-2). then to lug 9 (S-1). Dress the braid as shown.

( ) Slip a 3/8" rubber grommet over the other end of the line cord.

( ) Split the end of the line cord approximately 1" back from the end and separate the leads. Strip each lead 3/8" and tin. Insert the end of the cord through the hole in the side of the connector housing and tie a knot in the cord approximately 2" back from the end.



Detail 31B

( ) Connect one of the line cord leads to lug 11 of the connector socket (S-1). Connect the other lead to lug 15 (S-1).

( ) Now replace the connector socket in the connector housing with lugs 13, 14, and 15 positioned at the same end the line cord leaves the housing. Secure in place with the two pins supplied with the connector socket. Gently tap the pins in place until the ends protrude through the other side of the housing.

( ) Position the rubber grommet under the connector clamp and tighten the clamp with the two screws.

( ) Locate the speaker and connect the remaining audio cable coming from grommet F to the terminal strip on the speaker. Connect the outer braid to either one of the lugs (S-1). Connect the inner conductor to the other lug (S-1).

Refer to Detail 31C for the following steps.

( ) Locate the microphone and microphone connector. Install the connector by first removing the small screw from the shell of the connector and then removing the plug body. Slide the shell over the microphone cable,

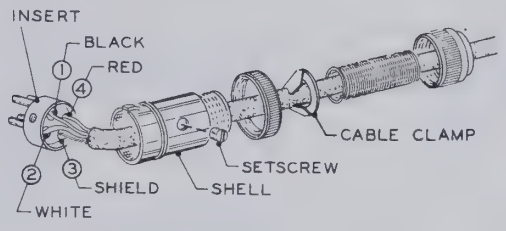
spring end first. Then slide the microphone cable clamp over the cord. Twist the strands together on each of the four leads and tin. Connect the microphone cable to the plug by inserting the tinned leads into the hollow plug terminals as follows:

( ) Connect the shield braid to terminal 3 (S-1).

( ) Connect the white lead to terminal 2 (S-1).

( ) Connect the red lead to terminal 4 (S-1).

( ) Connect the black lead to terminal 1 (S-1).



Detail 31C

( ) Replace the plug insert into the connector shell and secure it with the small setscrew. Push the cable clamp into the connector housing as far as it will go and tighten the spring retaining ring on the connector housing.

PRELIMINARY OPERATION CHECKS

Before applying power to the Transceiver, examine the wiring very carefully for possible shorts, such as tube lugs touching, resistor or capacitor leads contacting the chassis, or shield plates and terminal strip lugs touching. Also be sure no wire clippings or solder drops are still in the chassis. Check all solder connections. Make sure none have been missed except for solder lug 1 of PL-1, FT-5 and FT-14.

If there are any short circuits or leakage paths, serious damage may result to the tubes, components, and power transformer when power is applied. For this reason, it is important that the following checks be made before proceeding to the Testing and Alignment instructions.

See Pictorial 31 on Page 93 for a description and the location of all operational controls on the Transceiver. Set the controls as follows:

( ) AVC: OFF position.

( ) RF GAIN: full clockwise.

( ) BFO PITCH: control pushed in and full counterclockwise.

( ) ANL/SQUELCH: control pushed in and full counterclockwise.

( ) FINAL TUNE: full counterclockwise (butterfly plates completely meshed).

( ) SPOT: OFF position.

( ) AM-CW: AM position.

( ) AUDIO: PWR OFF position.

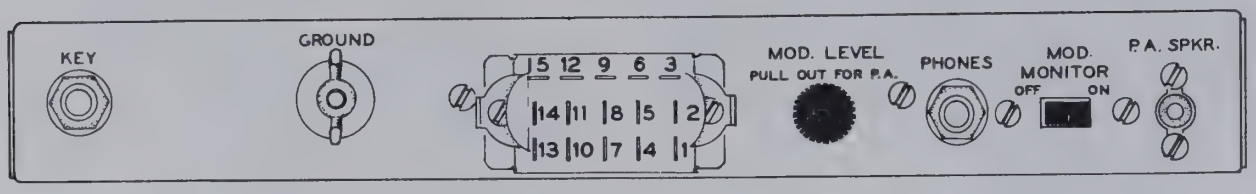
( ) X1-X2-X3-X4-VFO: X4 position.

( ) RCVR TUNE: dial pointer set at 50 mc mark.

( ) XMTR TUNE: dial pointer set at 50 mc mark.

( ) COUPLING: full clockwise (link coil coupled into final tank coil).

( ) LOADING: capacitor plates at full mesh.



Pictorial 32

See Pictorial 32 for the description and location of the controls on the rear apron of the Transceiver. Set these controls as follows:

( ) MOD. LEVEL: control pushed in and full counterclockwise.

( ) MOD. MONITOR: OFF position.

( ) Temporarily disconnect the two white leads from solder lug 1 of PL-1 on the front panel. See Pictorial 28, fold-out from Page 84.

NOTE: The following meter readings may vary ±20% depending on the type of instrument used. Slip a piece of paper between the connector lugs and the connector lock clips to avoid shorting these lugs to the chassis for the following checks.

( ) With an ohmmeter check all the lugs on the power connector socket for continuity and shorts by connecting one ohmmeter probe to the ground lug. Connect the other probe to each of the 15 lugs. The following steps indicate the readings that should be obtained with the controls set as outlined above. Any adverse readings must be completely investigated before proceeding further. See In Case Of Difficulty on Page 127.

Lugs 3, 6, and 9 should be 0 Ω. All other lugs should read infinite (∞).

( ) With one meter probe still connected to the chassis ground lug, connect the other probe to lug 14. Now turn the AUDIO gain control on. The meter should read 0 Ω. Return the control to the PWR OFF position.

( ) Connect one meter probe to lug 11 and connect the other probe to lug 15. The meter should read infinite (∞). Again turn the AUDIO gain control on. The meter should read approximately 4.5 Ω. Turn the AUDIO gain control off.

( ) Connect one meter probe to lug 1 and connect the other probe to lug 8. The meter should read infinite (∞). Now reconnect the white lead to solder lug 1 of PL-1 (S-2). With the white lead connected, the meter should now read approximately 12 Ω.

( ) Connect one meter probe to lug 4 and connect the other probe to lug 5. The meter should read approximately .1 Ω.

In the next 14 steps, one meter probe will be connected to the chassis ground lug.

Refer to Detail 34B, fold-out from Page 98, for location of components in the following steps.

( ) With one meter probe connected to the chassis ground lug, connect the other probe to lug 4 of terminal strip DD located in the power supply section. If a reading between 10 and 200 Ω is obtained with the meter in its lowest range, reverse the meter probes. A meter reading of 5 megohms or over is satisfactory. Because of the filter capacitors in this circuit, it may take a few seconds for the meter to reach this value.

( ) Connect the probe to FT-5 on the receiver subchassis. If a reading less than 5 KΩ is obtained, reverse the meter leads. The meter should read ∞.

( ) Repeat the above step, except connect the probe to FT-4. The meter should read 30 KΩ or more.

( ) Connect the probe to FT-3. The meter should read approximately 10 Ω.

( ) Connect the probe to FT-2. The meter should read 7 Ω or less (with RF GAIN control in full clockwise position). With the control full counterclockwise, the meter should read approximately 2 KΩ. Return the control to full clockwise position.

( ) Connect the probe to FT-1. The meter should read 0 Ω (with AVC switch in OFF position). With AVC switch in ON position, the meter should read 1.5 megohms. Return the AVC switch to OFF position.

( ) Connect the probe to FT-14. The meter should read 15 KΩ (with MOD. LEVEL control pushed in). With the MOD. LEVEL control pulled out, the meter should read infinite (∞). Return the MOD. LEVEL control to the pushed-in position.

( ) Connect the probe to FT-15. The meter should read approximately 18 KΩ.

( ) Connect the probe to FT-16. If a meter reading less than 10 KΩ is obtained, reverse the meter leads. The meter should read approximately 40 KΩ.

( ) Connect the probe to lug 5 of terminal strip AA located in the exciter section. The meter should read 15 KΩ. Now actuate relay RL-1 by pushing the end of the relay with your finger. The meter should read slightly higher than 15 KΩ.

( ) Connect the probe to FT-17 located on the VFO housing. The meter should read ∞.

( ) Connect the probe to FT-18. The meter should read approximately 12 Ω.

( ) Connect the probe to FT-19. The meter reading should be infinite. Rotate the crystal selector switch to the VFO position and move the SPOT switch to the ON position. The meter should now read 0 Ω. Return both switches back to their original position.

( ) Plug the AC power connector socket onto the power connector plug on the main chassis. NOTE: Do not plug into an AC outlet.

( ) Connect the meter probe to FT-18 again. The meter should now read approximately .1 Ω.

( ) Connect both meter probes across the fused AC plug. (NOTE: Be sure that 1-1/2 ampere fuses have been installed in the plug.) The meter reading should be infinite. Turn the AUDIO gain control on. The meter should now read 5 Ω. Return the AUDIO gain control to the PWR OFF position.

This completes preliminary operation checks. WARNING: If any adverse meter readings were obtained DO NOT PLUG THE AC PLUG INTO THE POWER MAINS. Recheck your work and refer to In Case Of Difficulty on Page 127.

IMPORTANT WARNING: TUBES CAN BE DAMAGED WHEN INSTALLING THEM IN THEIR SOCKETS. THEREFORE, USE EXTREME CARE WHEN INSTALLING TUBES AS WE DO NOT GUARANTEE OR REPLACE TUBES BROKEN DURING HANDLING OR INSTALLATION.

( ) Refer to Pictorial 33 and install all of the tubes in their respective sockets as shown.

( ) Install the 2-3/4" long black tube shield over the 6360 tube (V15).

( ) Install the 2-1/4" long tube shield over the OB2 tube (V9).

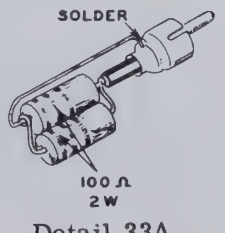
( ) Install the five 1-15/16" long tube shields over the five 9-pin miniature tubes, V1, V2, V3, V10, and V13.

( ) Install the seven remaining tube shields over the seven 7-pin miniature tubes.

( ) Install the vibrator at the vibrator socket observing orientation of the two large pins with respect to the two large holes in the socket. Be sure the vibrator is well seated.

( ) Plug the coax cable coming from the VFO housing into the phono jack marked VFO on the Pictorial.

( ) Supplied with the kit are two spare 100 Ω (brown-black-brown) 2 watt resistors. Parallel the two resistors by bending both leads of one of the resistors at right angles close to the resistor body. See Detail 33A. Place the two resistors next to each other and connect the leads just formed to the leads of the other resistor close to the resistor body. Solder both connections and clip off excess lead length of one resistor.



Detail 33A

( ) Slip a 1/2" length of sleeving over one of the leads from the parallel resistors, and insert this lead into the center pin of a phono plug as far as it will go without the phono plug sleeve shorting to the soldered connections. Now solder the center pin. Bend the other lead over and connect it to the phono plug sleeve (S-1). Clip off the excess lead from the center pin.

( ) Plug the dummy load just assembled into the antenna input phono jack. Be sure the ground lead of the dummy load does not short to the feed-through capacitors on the VFO housing. Refer to Pictorial 33.

CAUTION: BEFORE APPLYING POWER TO THE TRANSCEIVER, IT SHOULD BE NOTED THAT LETHAL VOLTAGES ARE PRESENT BOTH ABOVE AND BELOW THE CHASSIS. CARE SHOULD BE EXERCISED NOT TO TOUCH ANY HIGH VOLTAGE POINTS WITH YOUR HANDS. WELL INSULATED TOOLS SHOULD BE USED FOR ANY ADJUSTMENTS BEHIND THE PANEL.

TO AVOID SHOCK HAZARD, CONNECT A LEAD FROM A GOOD EARTH GROUND TO THE GROUND LUG LOCATED ON THE REAR APRON OF THE CHASSIS.

( ) Be sure all the controls are set as outlined on Page 95. Plug the line cord into a 117 volt AC, 50/60 cycle outlet. Now turn the AUDIO gain control on (but not full clockwise) and check to be sure that all tubes and dial lamps light up. NOTE: If any overheating is observed, or if one or both relays operate, unplug the line cord and locate the trouble. Refer to In Case Of Difficulty on Page 127.

( ) If nothing unusual is observed under these conditions after a short time, pick up the speaker and listen for a low-level hum. WARNING: If no hum or noise can be heard in the speaker, do not turn the AUDIO gain control full clockwise. Damage to the combination output-modulation transformer and/or the 6DZ7 audio output tube could result. Be sure MOD. MONITOR switch, located on the rear apron, is in its OFF position.

( ) If hum or noise can be heard in the speaker, and if everything else appears normal, turn the unit off and proceed to the Receiver Alignment section.

RECEIVER ALIGNMENT

When working with VHF frequencies, it becomes almost mandatory that certain types of test equipment be available for alignment. The Transceiver's performance will depend upon the type of equipment used and how well it is used.

For the utmost in performance and ease of alignment, a sweep generator covering the frequency range of 40 to 60 mc with a sweep width at least 10 mc wide, an oscilloscope, preferably with a built-in vertical preamplifier, and/or a signal generator of good quality should be used. See Equipment List on Page 132.

If the kit builder does not have access to the type of equipment just mentioned, a secondary method of alignment can be achieved using the VFO or a selection of crystals in the transmitter section of the Transceiver. An all band receiver (1.6 mc to 27 mc) and a 100 kc crystal calibrator are also helpful for alignment.

If the secondary method of alignment is chosen, it will be necessary to do the transmitter alignment first on Page 105 and then refer to Method II on Page 102. (However, it is suggested that all sections of the alignment procedure be read first so as to familiarize yourself with the different alignment setups.)

It should be pointed out that without the bottom plate installed on the chassis, and with meter leads connected to the various circuits, spurious signals may be heard when tuning across the band during the alignment procedure. These signals may be more pronounced during alignment and calibration of the Transceiver because of the various oscillator circuits working simultaneously. These signals should be ignored and the step-by-step instructions followed closely to avoid misalignment.

The most pronounced spurious signals that may be heard, will occur when using either the

Method II alignment procedure or when using the Transceiver's receiver for VFO calibration. When using the transmitter section of the Transceiver for a signal source, signals originating from the crystal oscillator-multiplier stage (V13-A) fall in the frequency range of 24.999 to 27.000 mc. These signals, through stray coupling to the second mixer (V3-A), will mix with the tunable oscillator (V3-B) output signals when the oscillator is tuned between 22.999 and 24.000 mc, resulting in the low frequency IF of 2 mc. These spurious signals appear, when reading the receiver dial scale between 52.999 and 54.000 mc. Consequently, the spurious signals in this range should not be confused with the desired signals when aligning or calibrating the Transceiver.

If difficulty is experienced in aligning and calibrating the Transceiver, it is suggested that all oscillator circuits be checked for proper frequency of operation using a wave meter, grid dip oscillator, or an all-band receiver covering the frequency ranges from 2 mc through 28 mc.

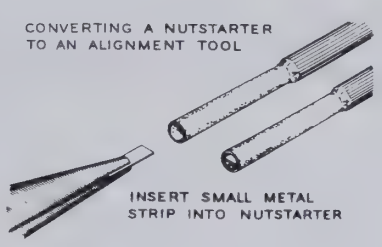
Outlined below are all of the oscillators and their proper frequency of operation.

BFO (V8) = 2 mc.
Tunable Osc. (V3-B) 20 mc to 24 mc.
XTAL OSC. (V2-B) 28 mc.
VFO (V12) 8.333 mc to 9.000 mc.
XTAL.OSC. Tripler (V13-A) 25 mc to 27 mc (depends on choice of crystals).

Listed on Page 134 are some of the spurious signals that may be encountered. The signal combinations should be studied carefully to avoid any "pitfalls" during alignment and calibration of the Transceiver.

( ) Supplied with the kit is a small rectangular steel blade. Referring to Detail 34A and using a pair of long-nose pliers, insert the blade into the smaller diameter hole of the plastic nut starter until the blade end is flush with the end of the nut starter. This now can be used as an alignment tool.

( ) Refer to Pictorial 34 (fold-out from Page 109) for identification of all adjustments regardless of the alignment method to be used. Preset the tubular capacitors and coil slugs as follows: Turn the brass screws clockwise into the capacitors until the screwhead rests against the palnuts. Then



Detail 34A

turn the screws out counterclockwise the number of turns outlined below. With the coil slug, do just the reverse; turn the slug all the way out counterclockwise (CCW) and then turn the slug back into the coil clockwise (CW) the number of turns outlined below. IMPORTANT: These preset adjustments are quite close to the finished alignment settings. Any adverse settings should be thoroughly investigated.

ADJUSTMENT	NUMBER OF TURNS
CAPACITORS	
( ) VAR. OSC. (C23)	Set the cutout in the direction shown in Pictorial 34.
( ) RF-1 (C2)	7-1/2
( ) 1st MIX (C13)	4-1/2
( ) 2nd MIX (C20)	9
COILS	
( ) RF-2 (L-4)	10-1/2
( ) RF-3 (L-3)	13
( ) XTAL.OCS. (L-5)	11-1/2

Most of the coil slugs in the cans are preset at the factory. Only slight readjustment of these coil slugs should be necessary.

METHOD I

PREFERRED METHOD OF RECEIVER ALIGNMENT

BE SURE THE AVC SWITCH IS IN ITS OFF POSITION FOR THE FOLLOWING ALIGNMENT.

( ) Set the Transceiver on its side with the receiver section up and the bottom toward you.

( ) Disconnect the RF choke (RFC-3) from FT-5 in the receiver subchassis and position it so that it does not touch any other components.

( ) Apply power to the Transceiver plus all alignment equipment and allow them to warm up for at least a half hour or more.

( ) Refer to Detail 34B (fold-out from Page 98) and connect a signal generator set at 2 mc with 30% of 400 cycle modulation to TC-2. Couple the output of the generator through a small capacitor (2-5 $\mu\mu$f) and be sure the generator ground is always connected to the Transceiver chassis.

( ) Connect the negative lead of a voltmeter (preferably a VTVM) to lug 2 of IF-4. Connect the positive lead to the chassis ground and set the voltmeter on its lowest range.

( ) Increase the generator output until the 400 cycle tone is heard in the speaker. If the signal cannot be heard with maximum output from the generator, couple the generator to lug 1 (color dot) of IF-3.

( ) (A) Using the plastic hexagon tuning tool supplied with the kit, adjust the top slug in IF-4 for a maximum meter indication. By inserting the tuning tool on through the top slug, adjust the bottom slug in IF-4 for a maximum meter indication. Now readjust the top slug going back and forth between the two slugs until no further increase in meter indication is obtained. Keep the generator output down to avoid overloading the IF amplifier. Only a small amount of meter deflection is necessary.

( ) (B) If the generator was coupled to lug 1 of IF-3 move it to lug 1 of IF-2. In a like manner adjust both slugs in IF-3 for maximum meter indication.

( ) (C) Now, with the generator coupled to TC-2, adjust both slugs in IF-2 for maximum meter indication.

( ) (D) With the signal generator still coupled to TC-2, readjust all IF slugs (IF-4, IF-3, and IF-2) until no further increase in meter indication can be obtained. Be sure to keep the signal generator output low.

( ) (E) Remove the 400 cycle modulation from the signal generator carrier. Pull the BFO PITCH control knob out and set the arrow on the knob straight up toward the top edge of the panel. Now slowly adjust the slug in the BFO can (L-8) until an audible beat note is heard in the speaker. Adjust the slug for zero beat (null indication on the voltmeter). Rotate the PITCH control both CW and CCW and observe if the note heard in the speaker is the same at each end of travel on the control. If not, it may be necessary to set the arrow on the knob slightly off center of the control's travel and readjust the slug for zero beat again until the same note is heard at each end of the control. When this is accomplished, turn the BFO off by pushing the knob in.

This completes the alignment of the 2 mc IF.

( ) (F) Couple the signal generator set at 22 mc with 30% of 400 cycle modulation to terminal 2 of RF-2 (L-4) located in the receiver subchassis.

( ) (G) Rotate the RCVR TUNE knob until the pointer sets in line with the 50 mc receiver dial mark.

( ) (H) Tune the generator around 22 mc until the signal is located. If the frequency read from the generator is lower than 22 mc, the variable oscillator coil slug (L-7) will have to be turned CCW to set the oscillator at the desired low-frequency setting. Reset the signal generator at 22 mc and adjust the coil slug (L-7) until the signal is heard in the speaker.

( ) (I) Rotate the RCVR TUNE knob until the Pointer is in line with the 54 mc receiver dial mark.

( ) (J) Set the signal generator at 26 mc and adjust the VAR. OSC. trimmer (C23) until the signal is heard in the speaker.

NOTE: Be sure the variable oscillator is operating at a frequency of 20 mc with the dial pointer set at the 50 mc receiver dial mark. This can be checked by proper position of the slug. Using the alignment tool, insert it into the coil until the end hits the top edge of the slug. Placing your finger at the point where the alignment tool leaves the can, the distance to the slug from the top edge of the can should measure approximately 7/16". Also a wave meter or grid dip meter can be used to check the frequency of oscillation by coupling near tube socket V3.

( ) (K) Now return the dial pointer to the 50 mc receiver dial mark and reset the signal generator to 22 mc. Repeat steps (H), (I), and (J) until receiver calibration is achieved at both ends of the band. NOTE: The more often the above and following steps are repeated, the better the overall calibration will be.

( ) (L) Set the receiver dial pointer to 54 mc with the signal generator set at 26 mc.

( ) (M) Adjust the 1st MIX trimmer (C13) for maximum meter indication.

( ) (N) Adjust the 2nd MIX trimmer (C20) for maximum meter indication.

( ) (O) Set the receiver dial pointer to 50 mc with the signal generator set at 22 mc.

( ) (P) Adjust the top slug in IF-1 for maximum meter indication.

( ) (Q) Adjust the bottom slug in IF-1 for maximum meter indication. NOTE: In some cases there will be two peaks using this slug. Use the peak which positions the slug nearest the bottom of the can.

( ) (R) Return the dial pointer to 54 mc and the signal generator to 26 mc. Repeat steps (M), (N), (O), (P), and (Q) until no further adjustments give increased meter indications.

NOTE: If it is observed that the signal output read from the meter is higher when the signal generator is set at 26 mc than it is at 22 mc, this is a normal condition.

This completes alignment of the 22 to 26 mc tunable IF.

( ) Remove the signal generator lead from RF-2.

( ) Remove the negative meter probe from lug 2 of IF-4.

( ) Supplied with the kit is a spare 100 KΩ (brown-black-yellow) resistor. Temporarily connect one lead to terminal 2 of RF-2 (L-4). Then connect the negative meter probe to the other end of the 100 KΩ resistor.

( ) Reconnect the RF choke (RFC-3) to FT-5 (S-1). CAUTION: Be sure to remove the power from the unit before making the connection.

( ) After power has been reapplied and the unit warmed up, adjust the XTAL. OSC. coil slug, L-5, for maximum meter indication (approximately -4 volts). (Use the plastic nut starter with the inserted blade for a tuning tool.)

( ) Remove the meter probe and the 100 KΩ resistor from the circuit.

This completes the crystal oscillator adjustment.

( ) Connect the signal generator output leads across the 50 Ω dummy load (which was inserted into the antenna input phono jack). If the generator used is terminated in 50 to 75 Ω, remove the dummy load and connect the output of the generator directly into the antenna input phono jack.

( ) Reconnect the negative lead of a voltmeter to lug 2 of IF-4. Connect the positive lead to chassis ground and set the voltmeter on its lowest range. Reading obtained should be approximately -.2 to -.5 volts. If a reading of more than -1 volt is obtained and the output heard is rough or squealing, the RF section may be oscillating. Back off each of the adjustments (RF-1, RF-2, and RF-3) slightly until the oscillations stop.

( ) Set the generator at 50 mc with 30% of 400 cycle modulation and rotate the RCVR TUNE knob until the dial pointer is at 50 mc. Tune the signal in for maximum meter deflection.

( ) Adjust the generator output until the signal heard is just audible or starts to deflect the voltmeter.

( ) (S) Adjust the RF-1 trimmer (C2) for maximum meter indication.

( ) (T) Set the generator at 52 mc and rotate the RCVR TUNE knob until the dial pointer is at 52 mc. Tune the signal in for maximum meter deflection.

( ) (U) Adjust the RF-2 coil slug (L-4) for maximum meter indication.

( ) (V) Set the generator at 54 mc and tune the signal in at the corresponding dial mark.

( ) (W) Adjust the RF-3 coil slug (L-3) for maximum meter indication.

If after these adjustments the RF section still has a tendency to oscillate, refer back to Pictorial 11 (fold-out from Page 46) and check to see if all components in the receiver subchassis are positioned as shown. It may also help to reposition some of the bypass capacitors (.001 μfd disc ceramic) around the tube socket V1 until oscillation stops.

( ) Reset the signal generator at 50 mc and return the dial pointer to the 50 mc dial mark, tuning the signal in for maximum meter indication. Now repeat steps (S), (T), (U), (V), and (W) until maximum overall gain is achieved at the above settings.

( ) Now remove all test equipment and place the Transceiver down with the front panel toward you.

( ) Check the front panel meter for mechanical zero. If the pointer is not set over the "0" mark, it can be adjusted by moving the small brass tab on the right-hand side of the meter behind the front panel. Use a non-metallic tool (such as the alignment tool) to move the brass tab.

( ) Turn the AVC switch ON and adjust the Meter Zero Adjust potentiometer until the pointer sets over the "0" marking.

( ) Place a drop of glue, coil dope, or fingernail polish on the XTAL. OSC., RF-2, and RF-3 coil slug screws at the point where they enter the coil form. This will help keep the slugs set when the unit is subjected to vibration under mobile operation.

This completes alignment of the Receiver section under Method I.

If it is desired to obtain better band-pass characteristics of the RF section, refer to the Sweep Generator And Oscilloscope Alignment Setup on Page 104. Otherwise refer to Transmitter Alignment on Page 105.

METHOD II

SECONDARY METHOD OF RECEIVER ALIGNMENT

Fairly good alignment can be achieved by the following method, but at some future date it is recommended that the alignment procedure under METHOD I be followed.

Be sure all adjustments have been preset as outlined on Page 99 and that the Transmitter Alignment has been done.

( ) Set the Transceiver on its side with the receiver section up and the bottom toward you.

( ) Solder the RF choke (RFC-3) and FT-5 connection in the receiver subchassis. See Detail 34B (fold-out from Page 98).

( ) Temporarily connect one lead of the spare 100 KΩ (brown-black-yellow) resistor to terminal 2 of coil RF-2. Then connect the negative probe of a voltmeter (preferably a VTVM) to the other resistor lead. Connect the positive probe of the voltmeter to the chassis ground.

( ) Apply power to the Transceiver and after the unit has warmed up, adjust the XTAL. OSC. coil slug (L-5) for maximum meter indication (approximately -4 volts). If a reading of over -1 volt is obtained and the output heard is rough or squealing, the RF section may be oscillating. Back off each of the RF adjustments (RF-1, RF-2, and RF-3) slightly until the oscillations stop.

( ) Now remove the meter probe and the 100 KΩ resistor.

( ) Connect the negative meter probe to lug 2 of IF-4.

( ) Using the plastic hexagon tuning tool supplied with the kit, adjust the top slug in IF-4 for a maximum meter indication or increased noise in the speaker. In a like manner, adjust the bottom slug in IF-4 by inserting the tuning tool in through the top slug. Now readjust the top slug, going back and forth between the two slugs until no further increase in noise or meter indication is obtained. Very little adjustment should be necessary.

( ) Repeat the above step on IF-3.

( ) In a like manner, adjust both slugs in IF-2.

( ) Now go back and readjust all six IF slugs (IF-4, IF-3 and IF-2) until no further increase in noise or meter indication can be had.

( ) Set the receiver dial pointer at the 54 mc dial mark. (If the VFO was not calibrated and crystals are going to be used for frequency control, set the dial pointer at the corresponding dial mark of a high frequency crystal.) See the interpolation chart on Page 133.

( ) Set the transmitter dial pointer at the 54 mc dial mark or at the corresponding dial mark of a high frequency crystal.

( ) Set the VFO-Crystal selector switch to the VFO position (or select the high frequency crystal position if used).

( ) Place the SPOT switch at the ON position.

( ) Adjust the VAR. OSC. trimmer capacitor (C23) for maximum meter indication or increased noise. If difficulty is experienced in hearing a signal from the exciter section, it may be necessary to couple the signal directly from this section to the receiver front end. Use a length of insulated wire coupled near coil L-11. Couple the other end near RF-2. Two or three signals may be heard at various settings of this trimmer. Use the signal nearest the preset position of the trimmer.

( ) Adjust the 1st MIX trimmer (C13) for maximum output.

( ) Adjust the 2nd MIX trimmer (C20) for maximum output.

( ) Set the receiver dial pointer at the 50 mc dial mark or at the corresponding dial mark of a low frequency crystal.

( ) Set the transmitter dial pointer at the 50 mc dial mark or at the corresponding dial mark of a low frequency crystal.

( ) Select the low frequency crystal position if used.

( ) Adjust the VAR. OSC. coil slug (L-7) for maximum meter indication or increased noise.

NOTE: Be sure the variable oscillator is operating at a frequency of 20 mc with the dial pointer set at the 50 mc receiver dial mark. This can be checked by proper position of the slug. Using the alignment tool, insert it into the coil until the end hits the top edge of the slug. Placing your finger at the point where the alignment tool leaves the can, the distance of the slug from the top edge of the can should measure approximately 7/16". Also a wave meter or grid dip meter can be used to check the frequency of oscillation by coupling near tube socket V3.

( ) Adjust the top slug in IF-1 for maximum output.

( ) Adjust the bottom slug in IF-1 for maximum output. NOTE: In some cases there will be two peaks using this slug. Use the peak which positions the slug nearest the bottom of the can.

( ) Return both dial pointers to the 54 mc dial mark or high frequency crystal position. Repeat the last nine steps until overall calibration of the VAR. OSC. and maximum gain of the first IF is achieved.

( ) Now set both dial pointers at the 50 mc dial marks or corresponding frequency of a low frequency crystal.

( ) Adjust the RF-1 trimmer (C2) for maximum output.

( ) Set both dial pointers at the 52 mc dial marks or corresponding frequency of a crystal near this frequency.

( ) Adjust the RF-2 coil slug (L-4) for maximum output.

( ) Set both dial pointers at the 54 mc dial mark or corresponding frequency of a high frequency crystal.

( ) Adjust the RF-3 coil slug (L-3) for maximum output.

If after these adjustments the RF section still has a tendency to oscillate, refer back to Pictorial 11 (fold-out from Page 46) and check to see if all components in the receiver subchassis are positioned as shown. It may also help to reposition some of the bypass capacitors (.001 μfd disc ceramics) around tube socket V1 until oscillation stops.

( ) Now repeat the last six steps until maximum overall gain is achieved at the above settings.

The above three adjustments should place the RF section within the desired band-pass of 50 to 54 mc.

( ) Reset the dial pointers at the 50 mc dial marks.

( ) Pull the BFO PITCH control knob out and set the arrow on the knob straight up towards the top edge of the panel. Slowly adjust the BFO coil slug (L-8) until an audible beat note is heard in the speaker. Adjust the slug for a zero beat (null indication on the voltmeter). Then turn the BFO off by pushing the knob in.

( ) Return the SPOT switch to the OFF position.

This completes alignment of the receiver section under Method II.

This completes all alignment. Refer to Final Assembly on Page 110.

SWEEP GENERATOR AND OSCILLOSCOPE ALIGNMENT SETUP

See Detail 34C for the RF section alignment setup using a sweep generator and oscilloscope. If the sweep generator lacks a built-in marker generator, a signal generator can be lightly coupled to lug 1 of the antenna relay (RL-2). Use a turn or two of insulated wire or a capacitor of 1 to 5 $\mu\mu$f. Some sweep generators have provisions for coupling external signal generators on the test unit itself.

( ) Connect the sweep generator output across the dummy load, connecting the generator ground to the ground side of the dummy load.

( ) Connect the vertical input probe of an oscilloscope to the free end of the 100 KΩ resistor connected to RF-2.

( ) Set the frequency of the sweep generator to sweep the range of 40 to 60 mc.

( ) Set the frequency of the marker generator to 52 mc. Adjust the output to produce a marker just barely visible. Too strong a marker will distort the trace.

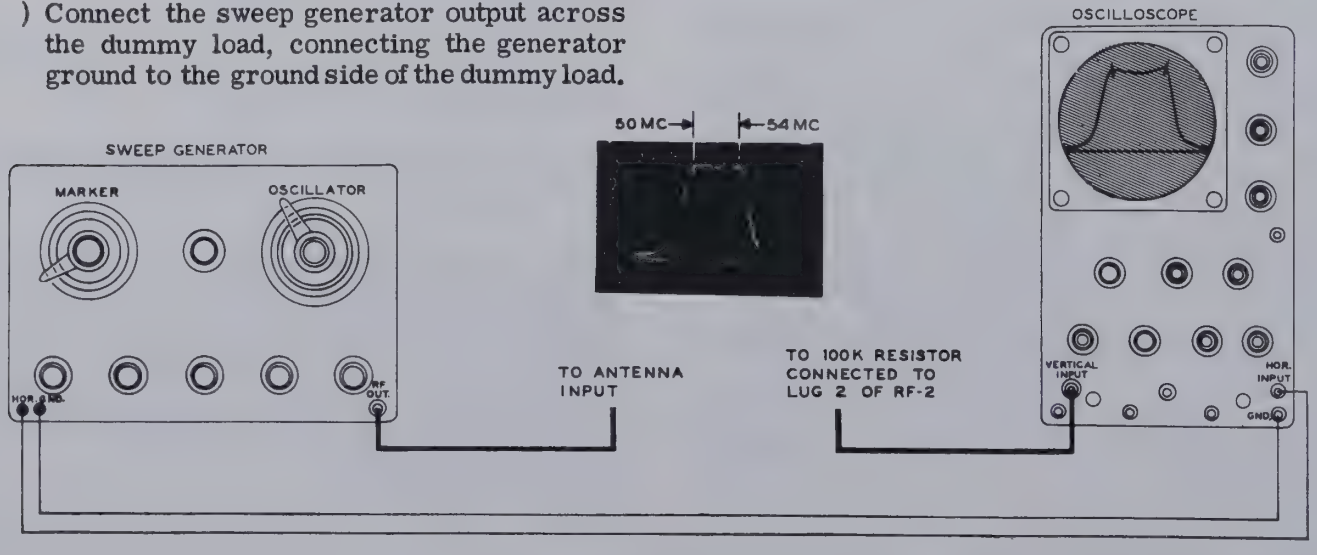
( ) Adjust the RF-2 (L-4) and RF-3 (L-3) coil slugs until a band-pass shape and maximum gain, as shown in the oscillogram, is achieved over the range of 50 to 54 mc with the marker in the center of the band-pass. Then adjust the RF-1 trimmer (C-2) for maximum overall gain.

Observe that the RF-3 adjustment places the band-pass at the desired frequency, the RF-2 adjustment controls the width of the band-pass, and the RF-1 adjustment changes the overall gain. All three adjustments interact with each other, so repeat the adjustments until the desired band-pass is obtained. Set the marker to 50 and 54 mc to check the band-pass edges.

If one portion of the band is favored (for example 50 to 52 mc), adjustment of RF-1, RF-2 and RF-3 within this band-pass will give slightly more gain.

( ) Remove the oscilloscope, sweep generator and the 100 KΩ resistor.

This completes sweep alignment of the receiver section.



Detail 34C SWEEP GENERATOR AND OSCILLOSCOPE ALIGNMENT SETUP

TRANSMITTER ALIGNMENT

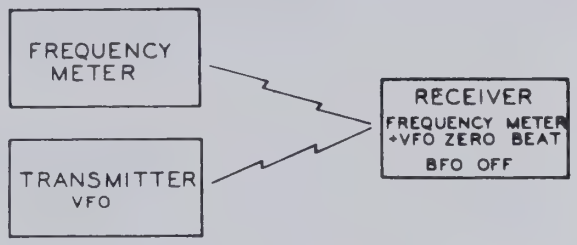
VFO CALIBRATION

Frequency standards such as the surplus LM or BC series, a good all-band receiver, and a 100 kc crystal calibrator are all excellent pieces of equipment for calibration, if properly used and checked against WWV. For those kit builders that do not have access to the type of equipment just mentioned, a selection of crystals, preferably near the band edges, should be accumulated.

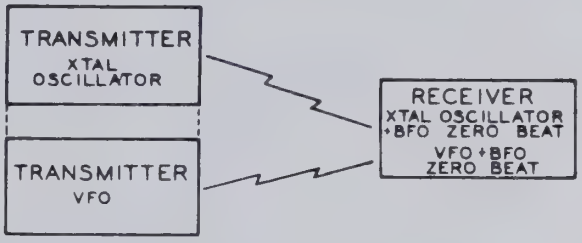
NOTE: Not all crystals are exactly on frequency as marked on the crystal holder due to aging, poor original calibration or oscillator circuit variations. This is particularly true of the surplus type of crystals.

The crystals are installed in the crystal sockets on the transmitter section and compared to the VFO frequency by means of the receiver with the BFO turned on. NOTE: If Method I of the Receiver Alignment on Page 99 was not attempted, then a separate receiver capable of tuning 8.333 to 9.000 mc or the harmonics of these frequencies such as 16, 24, 32, ...50 mc, will have to be used. Under calibration of the VFO, reference will be made to the calibration marks on the Transceiver. On Page 133 is a chart for interpolation of the dial readings against the fundamental frequency of the VFO, crystals, and separate receiver. If a frequency meter or crystal calibrator is used, it can beat against the VFO frequency in the receiver.

If a frequency meter is used for calibration, the frequency meter signal and the VFO signal should be zero beat against each other in the receiver with the BFO off. Under these conditions the VFO frequency is the same as the frequency meter. See Detail 34D. If crystals are being used for calibration, set the receiver to the crystal frequency with the BFO on and zero beat the BFO in the receiver against the crystal oscillator signal from the transmitter section. Then set the VFO to zero beat against the receiver, which is still tuned to the crystal frequency. Under these conditions, the VFO frequency is the same as the crystal frequency. See Detail 34E.



Detail 34D



Detail 34E

If a 100 kc crystal calibrator is used for calibration, be sure to determine which marker is the proper frequency. This can be done by checking the crystal calibrator against a receiver known to be accurate at the frequency to be used for calibration. Aside from these slight differences in measurement technique, the following procedure may be used for either method of calibration. Refer to Pictorial 34 (fold-out from Page 109) for location and identification of the various calibrating adjustments.

It should be noted that the padder capacitor (C79) is used to set the bandspread covered on the dial while the VFO coil (L-9) is used to set a definite frequency point on the dial. The coil slug is set to the calibration frequency near the low end of the dial and the padder capacitor is adjusted so that the calibration frequency at the high end of the band coincides with the dial reading. These two adjustments interact with each other and, therefore, will have to be adjusted alternately until optimum overall calibration is obtained.

The differential capacitor (C76) which varies the amount of temperature compensating ca-

pacity in the VFO circuit can be adjusted to suit the individual's operating habits. Because of the varied temperature conditions that the Transceiver may be exposed to, the differential capacitor is adjusted for proper VFO operation after the unit is installed in its operating position. See Page 126.

Before beginning calibration, temporarily install the remaining large knob on the XMTR TUNE shaft. Then check to be sure that with the transmitter dial pointer at the low end of the scale, the VFO capacitor plates are closed (full mesh).

Now preset the VFO adjustments as follows:

( ) Set the differential capacitor (C76) so that the rotor plates are half meshed with each set of stator plates. Position the rotor plates toward the top of the VFO housing.

( ) Set the padder capacitor (C79) so that the rotor plates are only meshed approximately 3/4" into the stator plates.

( ) Set the VFO coil slug (L-9) until the screw protrudes 13/16" from the VFO housing.

( ) Also preset the VFO output coil (L-10) located at the rear of the main chassis. Set the slug until it protrudes 13/16" up from the chassis.

( ) Now mount the VFO top plate to the top of the VFO housing using six #6 sheet metal screws.

Preset the following adjustments in the same manner as was done under Receiver Alignment on Page 98.

( ) Set the XTAL. OSC. plate coil slug (L-11) 11/16" up from the chassis.

( ) Set the MULT. PADDER capacitor (C97) 11 turns out from the palnut.

( ) Set the DRIVER PADDER capacitor (C104) 12 turns out from the palnut.

( ) Set the MULT. TRIMMER capacitor (C95) with the cutout in the direction shown on Pictorial 34.

( ) Set the DRIVER TRIMMER capacitor (C105) with the cutout in the direction shown.

With the SPOT switch placed in the ON position and all other controls set as outlined on Page 95, allow the Transceiver, frequency meter or crystal calibrator, and separate receiver if used, to warm up for at least one half hour or more.

When settings for the receiver are called for in the following steps, and if a different receiver is used for calibration, the calibrating receiver will be set at 8.333 and 9.000 mc respectively. (Refer to the chart on Page 133 for interpolation of the dial readings against the fundamental frequency of the VFO.) These settings will be marked with an asterisk (*). Reference to the chart should make these changes self-evident.

If Method I under Receiver Alignment was accomplished, then the Transceiver receiver can be used for VFO calibration, although an all-band receiver will allow easier and more accurate calibration of the VFO. If difficulty is experienced in hearing a signal from the frequency meter or crystal calibrator, if used, it may be necessary to couple the output of these instruments directly into the antenna input on the Transceiver. Also, if difficulty is experienced in hearing the VFO signal in the receiver, couple the signal directly from coil (L-10) to the front end of the receiver using a length of insulated wire placed near the respective circuits. NOTE: Be sure to study the spurious signal list on Page 134 to avoid calibrating the VFO on the wrong frequency.

CALIBRATION WITH FREQUENCY METER

*Settings for separate receiver.

( ) Set the transmitter dial pointer at the 50 mc mark.

*( ) Set the receiver dial pointer at the 50 mc mark. *(8.333 mc.)

( ) Set the frequency meter at 8.333 mc.

( ) Adjust the VFO coil slug (L-9) for zero beat against the frequency meter signal in the receiver. (Double check for proper frequency of the VFO using wave meter, grid dip oscillator or separate receiver.)

( ) Now set the transmitter dial pointer at the 54 mc mark.

*( ) Set the receiver dial pointer at the 54 mc mark. *(9.000 mc.)

( ) Set the frequency meter at 9.000 mc.

( ) Adjust the padder capacitor (C79) for zero beat in the receiver.

*( ) Return the transmitter and receiver dial pointers to the 50 mc marks. Also reset the frequency meter at 8.333 mc.

Repeat the preceding nine steps until calibration is achieved at both ends of the band.

After VFO calibration is complete, refer to Alignment of Exciter Stages.

CALIBRATION WITH CRYSTALS

A selection of crystals, preferably near the band edges, in the 8.333 to 9.000 mc range should be used. Observe that looking from the front of the Transceiver, the crystal socket at the left is for the X1 position on the Crystal-VFO selector switch, and the crystal socket at the right corresponds to the X4 position. Placing the low frequency crystal in the X1 crystal socket position and the high frequency crystal in the X4 crystal socket position will help avoid confusion during calibration. The BFO in the *receiver will be left ON during the following calibration of the VFO.

( ) Set the crystal-VFO selector switch to the low frequency crystal socket position.

( ) Set the transmitter dial pointer at the dial marking which corresponds to the low frequency crystal.

*( ) Tune the receiver to the low frequency crystal oscillator signal and zero beat the receiver.

( ) Set the crystal-VFO selector switch to the VFO position.

( ) Adjust the VFO coil slug (L-9) for zero beat in the receiver. (Double check for proper frequency of the VFO using a wave meter, grid dip oscillator or separate receiver.)

( ) Set the crystal-VFO selector switch to the high frequency crystal socket position.

( ) Set the transmitter dial pointer at the dial marking which corresponds to the high frequency crystal.

*( ) Tune the receiver to the high frequency crystal oscillator signal and zero beat the receiver.

( ) Set the crystal-VFO selector switch back to the VFO position.

( ) Adjust the padder capacitor (C79) for zero beat in the receiver.

( ) Return the crystal-VFO selector switch back to the low frequency crystal socket position.

( ) Reset the transmitter dial pointer at the dial marking which corresponds to the low frequency crystal.

( ) Repeat all the above steps until calibration of the VFO is achieved at both crystal frequencies.

ALIGNMENT OF EXCITER STAGES

The exciter stages of the transmitter are aligned to track with the VFO calibration to provide single knob tuning of all of these stages.

( ) Remove the two brown leads and the .02 disc capacitor lead from FT-14 and position the leads so they cannot short to the chassis or other components.

( ) Temporarily connect one lead of the spare 100 KΩ (brown-black-yellow) resistor to lug 8 of tube socket V13 located in the transmitter exciter section. See Detail 34B. Then connect the negative probe of a voltmeter to the other resistor lead. Connect the positive lead to the main chassis ground terminal.

For the following alignment, the AM-CW switch will be used to apply power to the exciter section. The setups should be made first, then the switch is placed in the CW position with adjustments made as quick as possible until overall alignment is achieved. Then return the switch to the AM position until the next setup is made.

( ) Place the crystal-VFO selector switch in the VFO position.

( ) Set the transmitter dial pointer at the 52 mc dial mark.

( ) Place the AM-CW switch in the CW position.

( ) Adjust the VFO output coil slug (L-10) for maximum meter indication. Adjustment of this coil may affect VFO calibration, therefore, it may be necessary to touch up the VFO calibration.

( ) Remove the 100 KΩ resistor from lug 8 of tube socket V13 and temporarily connect one lead of the resistor to lug 2 of V13. Connect the negative probe of the voltmeter to the other resistor lead.

( ) Adjust the XTAL. OSC. plate coil slug (L-11) for maximum meter indication.

( ) Remove the 100 KΩ resistor from lug 2 of tube socket V13 and temporarily connect one lead of the resistor to lug 1 of tube socket V14. Connect the negative probe of the voltmeter to the other resistor lead.

CAUTION: Use an insulated alignment tool when adjusting the two trimmer capacitors (C95 and C105), such as the plastic nut starter with the inserted blade. Because of RF on these trimmers, the blade may detune the circuits slightly, but adjusting slightly beyond maximum meter indication will offset the blade's effect when removed.

( ) Adjust the MULT. TRIMMER capacitor (C95) for maximum meter indication.

( ) Remove the 100 KΩ resistor from lug 1 of tube socket V14 and connect it to lug 4 of terminal strip BB. Connect the positive probe of the voltmeter to the other resistor lead and connect the negative lead to the main chassis ground terminal. CAUTION: With the AM-CW switch in the AM position, the voltmeter will read approximately 15 volts. With the switch in the CW position and after alignment of the exciter section, the voltmeter should read approximately .6 volt. Be sure to place the voltmeter at a higher voltage range before returning the AM-CW switch to the AM position.

( ) Adjust the DRIVER TRIMMER capacitor (C105) for maximum meter indication.

( ) Set the transmitter dial pointer at the 54 mc dial mark.

( ) Adjust the DRIVER PADDER capacitor (C104) for maximum meter indication.

( ) Adjust the MULT. PADDER capacitor (C97) for maximum meter indication.

( ) Set the transmitter dial pointer at the 50 mc dial mark.

( ) Adjust the driver TRIMMER capacitor (C105) for maximum meter indication.

( ) Adjust the MULT. TRIMMER capacitor (C95), for maximum meter indication.

( ) Return the transmitter dial pointer back to the 54 mc dial mark and repeat the last six steps until overall tracking is achieved across the band.

( ) Now set the transmitter dial pointer to 52 mc and recheck the XTAL. OSC. and VFO output coil slug adjustments for maximum meter indication. Any value over .4 volt but not more than .8 volt, is satisfactory.

With the AM-CW switch left in the CW position, tune the exciter stages from one end of the band to the other and observe the voltmeter. The voltage read should be fairly constant as the exciter stages are tuned across the band. A variation of up to .3 volt will still provide satisfactory performance.

If difficulty is experienced in getting the exciter stages to track properly, check the air-wound coils to be sure they have not been deformed. You may find it helpful to slightly compress or spread the turns apart to achieve proper tracking. This is also true of the final tank coil if it is found that the final tuning capacitor does not tune the circuit over the entire 6-meter range.

After tracking of the exciter stages is complete, be sure to recheck VFO calibration. Then remove the 100 KΩ resistor and voltmeter from the circuit.

TESTING FINAL AMPLIFIER

When checking the final amplifier stage, make sure the 50 Ω dummy load is plugged into the antenna jack. CAUTION: Never energize the transmitter without the proper load (either dummy or an antenna) connected.

NOTE: The front panel meter is an RF voltmeter and when the transmitter section is energized, the meter is automatically switched to read relative power output. Consequently, the meter will read up-scale for maximum RF output. DO NOT ATTEMPT TO TUNE THE FINAL FOR A "DIP" OR MINIMUM READING ON THIS METER.

At full RF output into a pure resistive load, the meter should read approximately half scale (8 to 10 watts). If the load is reactive (antenna and transmission line mismatched), the RF voltmeter will tend to read farther upscale, consequently giving a false output indication. Be sure to check the antenna system with a SWR bridge.

Due to the fact that the dummy load supplied with the kit is only capable of 4 watts dissipation, and the transmitter is capable of up to 10 watts output, applied power to the transmitter should be left on only for short periods of time for the following checks. When the dummy load becomes hot or starts smoking, remove power from the transmitter section and allow the load to cool off before proceeding to the next step.

( ) Reconnect the two brown wires and .02 disc capacitor lead to FT-14 (S-3).

( ) Set the transmitter dial pointer at the 52 mc dial mark. (If crystal control operation is proposed, select a crystal near this frequency and set the dial pointer to correspond.)

( ) Remove the XMTR TUNE knob from the tuning shaft.

( ) Using a narrow blade screwdriver, preset the coupling control until the link coil is coupled approximately halfway into the final tank coil.

( ) Using the same screwdriver, insert it into the loading capacitor shaft (there is a screwdriver slot located inside the shaft) and adjust the capacitor until the plates are completely closed (full mesh).

( ) Place the crystal-VFO selector switch to the frequency control mode chosen.

( ) Place the AM-CW switch in the CW position. Return the switch to the AM position or remove the power plug from the AC outlet immediately in case of an arc, apparent overload, or a growling sound from the power transformer. If everything appears normal, adjust the FINAL TUNE control for a maximum indication on the front panel meter.

( ) Adjust the COUPLING control for maximum meter indication.

( ) Adjust the LOADING control for maximum meter indication.

( ) Now repeak the FINAL TUNE control and readjust the COUPLING and LOADING controls until adjustment causes no further increase in power output.

( ) Repeat loading of the transmitter at the low and high ends of the band.

Observe that the COUPLING and LOADING controls needed very little readjusting. Once these two controls are adjusted for a particular antenna and in the section of the band the operator proposes to operate mostly, they need not be readjusted for each frequency change; provided, of course, that the antenna and transmission line are matched properly to the transmitter. Transmission lines and antennas will be covered later under Installation and Operation.

( ) To check CW operation, insert the plug from a key into the key jack located on the rear apron. Place the AM-CW switch in the CW position. Observe that the front panel meter indicates a zero reading. Now depress the key. The meter should indicate approximately a half-scale reading. It should be noted that in CW operation the modulator is inoperative.

( ) Remove the plug from the key jack.

( ) Insert the microphone plug into the MIKE connector socket on the front panel. Depress the microphone button. The meter should read about half-scale. (RF output in the AM position will be slightly lower than in CW.) Now slowly adjust the MOD. LEVEL control, located on the rear apron, in a clockwise direction while talking into the microphone. The meter should start kicking upward as you speak. Setting the

control about midway of its travel should give about 100% modulation level. The exact setting of the MOD. LEVEL control for 100% modulation will depend on the operator's talking characteristics and should be checked using an oscilloscope. Connecting the vertical plates of an oscilloscope directly across the dummy load through a short length of 50 Ω coax cable will give sufficient signal on most oscilloscopes at this frequency for checking the modulation envelope pattern.

Inserting a set of low-impedance head phones into the phone jack and placing the MOD. MONITOR switch at the ON position, allows monitoring of the audio on the RF carrier.

The tuning procedure just outlined for the final amplifier will also apply when loading an actual antenna.

This completes Transmitter alignment.

PUBLIC ADDRESS OPERATION CHECK

( ) Plug an external 8 Ω speaker capable of at least 15 watts into the PA SPKR socket located on the rear apron. Pull the MOD. LEVEL control knob out. Depress the microphone button and while talking into the microphone, slowly adjust the MOD. LEVEL control in a clockwise direction. Locate the external speaker as far away as possible from the microphone to avoid feedback. Leaving the MOD. LEVEL control pulled out, the receiver can be monitored at some distance from the unit using the external speaker.

If Method I under Receiver Alignment was not accomplished, turn back to Page 102 and proceed with Method II under Receiver Alignment. Otherwise, this completes testing, adjustment and calibration of your "SHAWNEE" 6-Meter Transceiver.

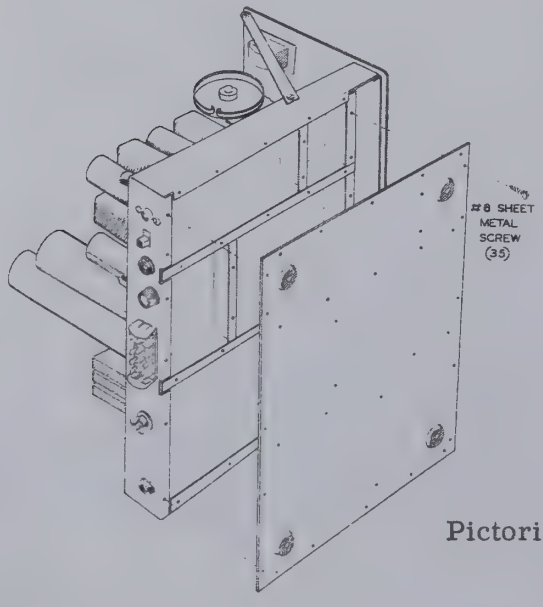
FINAL ASSEMBLY

( ) Locate the chassis bottom plate (#205-M255). Before mounting the plate to the bottom of the chassis, check each screw mounting hole location to be sure that when each sheet metal screw is fastened in place, there will be no possibility of shorts.

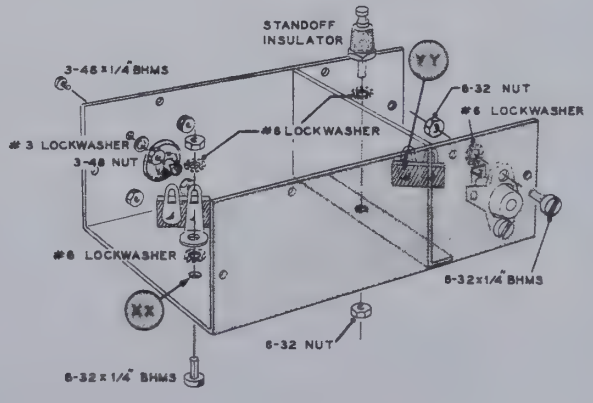
( ) Orient the bottom plate so that all the mounting holes on the plate line up with their respective holes on the chassis as shown in Pictorial 35. Be sure the embossed feet on the plate are facing out as shown. Now start thirty-five #6 sheet metal screws into the bottom plate. When all the sheet metal screws have been started, then securely tighten each screw in place. IMPORTANT: To realize the best shielding and noise free operation of the unit, all the screws should be used.

LOW-PASS FILTER ASSEMBLY

Refer to Pictorial 36 for the following steps.



Pictorial 35



Pictorial 36

( ) Locate the low-pass filter base housing (#214-M10) and mount the remaining phono socket at the location shown. Use 6-32 x 1/4" hardware to secure it in place.

( ) Mount the coaxial jack, using the remaining 3-48 x 1/4" hardware. Install it with the center terminal opening up as shown.

( ) Mount the two remaining 2-lug terminal strips at XX and YY as shown. Use 6-32 x 1/4" hardware.

( ) Locate the two filter shield plates (#206-M134) and mount one of the plates at the right-hand end, as shown, using a ceramic standoff CS-4. Secure with a #6 lockwasher and 6-32 nut. It may be necessary to spread the sides of the base housing slightly to get the shield plate in place.

Refer to Pictorial 37 (fold-out from Page 110) for the following steps.

( ) Bend the center lug of the phono socket at a right angle as shown.

( ) C115. Cut both leads of a 30 $\mu\mu$f mica capacitor to 3/8". Connect one lead to lug 1 of terminal strip YY (NS). Connect the other lead to lug 2 of YY (NS).

( ) C116. Cut both leads of a 100 $\mu\mu$f mica capacitor to 1/2". Connect one lead to the ceramic standoff terminal CS-4 (NS). Connect the other lead to lug 2 of terminal strip YY (S-2).

NOTE: When handling and mounting coils in the following steps, avoid deforming the coils.

( ) Connect one lead of a filter center leg 8-turn coil (#40-339) to the ceramic standoff terminal CS-4 (NS). Position the coil as shown and connect the other lead to the center lug of the phono socket (NS). Cut off any excess lead length.

( ) Cut both leads of a filter termination 6-turn coil (#40-340) to within 1/2" of the coil body. Connect one lead to lug 1 of terminal strip YY (S-2). Position the coil up at an angle from the terminal strip and connect the other lead to the center lug of the phono socket (S-2).

( ) Insert one lead of a second center leg 8-turn coil (#40-339) through the hole in the shield plate and make a half-turn loop around the ceramic standoff terminal CS-4. Make sure the lead is centered in the hole and then solder the terminal (S-3).

( ) Bend the coil upward slightly and insert the other lead through the hole of the other filter shield plate. Now slip the shield plate down into position as shown and fasten it in place with the remaining ceramic standoff CS-3, using a 6-32 nut and lockwasher.

( ) Connect the other lead of the center leg coil to the ceramic standoff terminal CS-3 just installed (NS). Be sure the lead is centered in the shield plate hole.

( ) C118. Cut both leads of the remaining 30 $\mu\mu$f mica capacitor to 3/8". Connect one lead to lug 1 of terminal strip XX (NS). Connect the other lead to lug 2 of XX (NS).

( ) C117. Cut both leads of the remaining 100 $\mu\mu$f mica capacitor to 5/8". Connect one lead to the ceramic standoff terminal CS-3 (NS). Connect the other lead to lug 2 of terminal strip XX (S-2).

( ) Cut both leads of the remaining filter center leg 8-turn coil (#40-339) to 1/2". Connect one lead to the ceramic standoff terminal CS-3 (S-3). Connect the other lead to the coaxial jack terminal by placing the lead in the terminal cutout (NS).

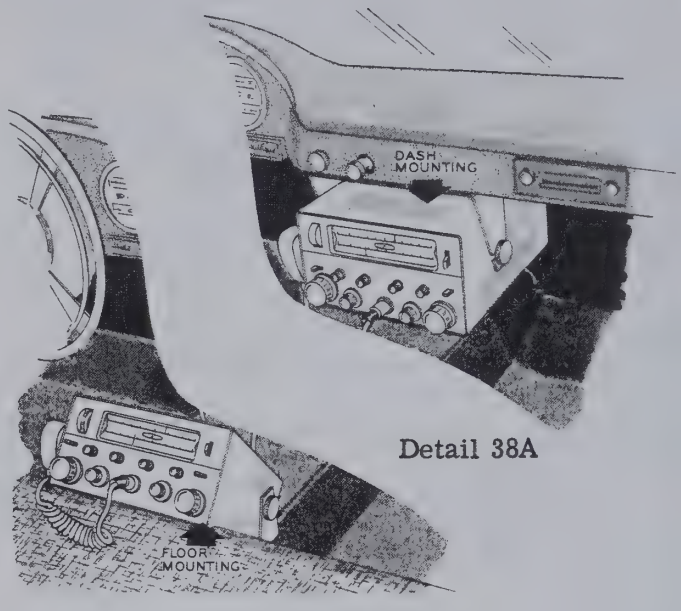
( ) Cut one lead of the remaining filter termination 6-turn coil (#40-340) to 1/2". Connect this lead to lug 1 of terminal strip XX (S-2). Position the coil up at an angle from the terminal strip and connect the other lead to the coaxial jack terminal by placing the lead in the terminal cutout (S-2).

This completes wiring of the low-pass filter. Make sure the components are positioned as shown in the Pictorials and that none of the coils have been deformed.

( ) Locate the low-pass filter cover and slip it over the base. Secure the cover in place from the back side only, using four #6 sheet metal screws as shown in Detail 37A (fold-out from Page 110).

INSTALLATION IN CABINET

At this time it should be determined how the Transceiver will mount in the automobile if mobile operation is anticipated. The unit was primarily designed to mount under the dashboard of the automobile, using the gimbal bracket. Realizing that on some of the later model automobiles, this may be impracticable, mounting of the unit may have to be done on the transmission hump. Two extra holes on both sides of the cabinet near the rear edge have been provided for this type of mounting. Illustrated in Details 38A and 38B are suggested methods for mounting the unit.

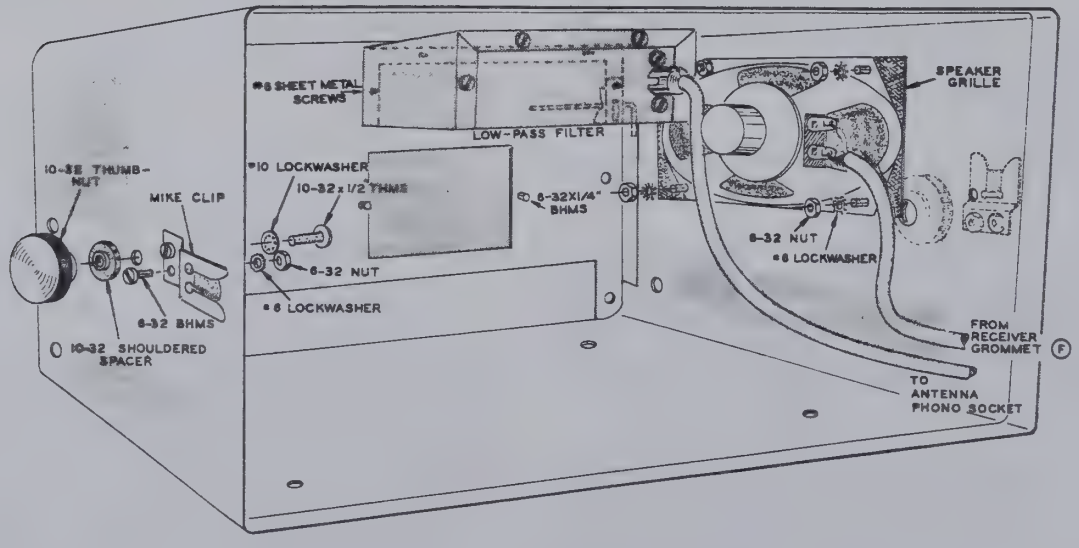


Detail 38A

Detail 38B

It is suggested that the 10-32 thumbnut, shouldered spacer and the 10-32 x 1/2" truss head machine screws be temporarily installed in one of the three holes on each side of the cabinet. See Pictorial 38. Then take the cabinet and gimbal bracket and determine the best position for mounting in the automobile. NOTE: Allow 2" of clearance at the rear of the cabinet for the power plug and antenna connector.

After determining how the Transceiver will mount, proceed with the following step-by-step. If the Transceiver is going to be used as a fixed station only, then the gimbal bracket can be used as a stand, if desired. If this is the case, install the hardware as shown in Pictorial 38.



Pictorial 38

( ) Use the slots in the gimbal bracket as a template and mark at least three mounting holes for the bracket. Use the #28 drill supplied with the kit to drill the holes and #10 x 1/2" slotted acorn head sheet metal screws to secure in place. It may be necessary to tap the screws through the slots in the bracket.

( ) Place a #10 lockwasher over each of two 10-32 x 1/2" truss head machine screws and insert the screws through one of the 7/32" set of holes selected for mounting purposes. Secure the screws in place, using the 10-32 shouldered spacer. Then start the 10-32 thumbnuts on each screw.

( ) Observe that there are two mounting locations for the mike clip on either side of the cabinet and also two mounting positions. Select the mounting location and position, and mount the mike clip to the cabinet, using 6-32 x 1/4" hardware.

( ) Place the cabinet near the Transceiver chassis rear apron. Place the speaker grille over the four mounting studs inside the cabinet. Now place the speaker over the four mounting studs and secure it in place with #6 lockwashers and 6-32 nuts as shown.

( ) Mount the low-pass filter housing inside the cabinet on the rear panel, with the coax jack protruding through the square cutout. Start three #6 sheet metal screws into the filter from the back side of the cabinet. See Pictorial 39 on Page 114. Place the Fahnestock clip over a fourth #6 sheet metal screw and mount it in the position shown. Now tighten all four sheet metal screws.

( ) Locate the remaining length of coax cable and install a phono plug on each end as shown in Detail 38C.

( ) Plug one end of the coax cable into the phono socket on the low-pass filter.

( ) Now slip the main chassis into the cabinet, dressing the speaker cable between the power transformer, and the vibrator and filter can. Also, after the chassis is inserted about halfway in, plug the other end of the coax cable from the low-pass filter into the ANTENNA phono socket. Also see Pictorial 33 (fold-out from Page 97). Now move the chassis completely into the cabinet.

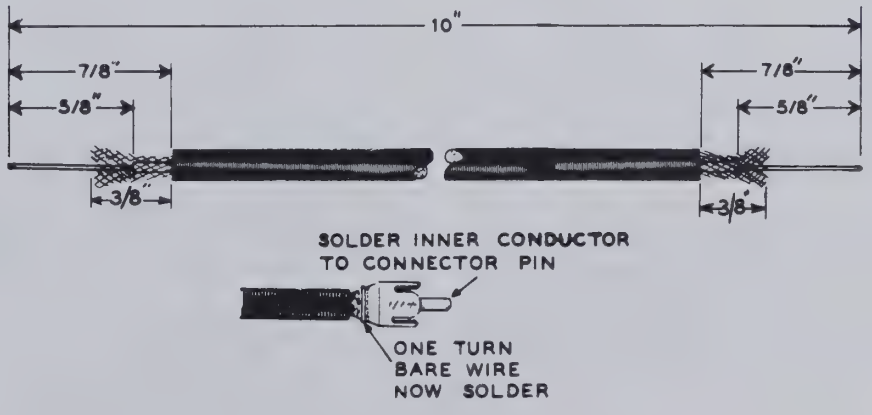
( ) Place the four rubber feet on the four 10-32 x 3/8" Phillips head machine screws. Secure the main chassis to the cabinet by inserting the screws through the four holes in the bottom of the cabinet and into the weldnuts on the bottom plate of the main chassis as shown in Pictorial 39 on Page 114.

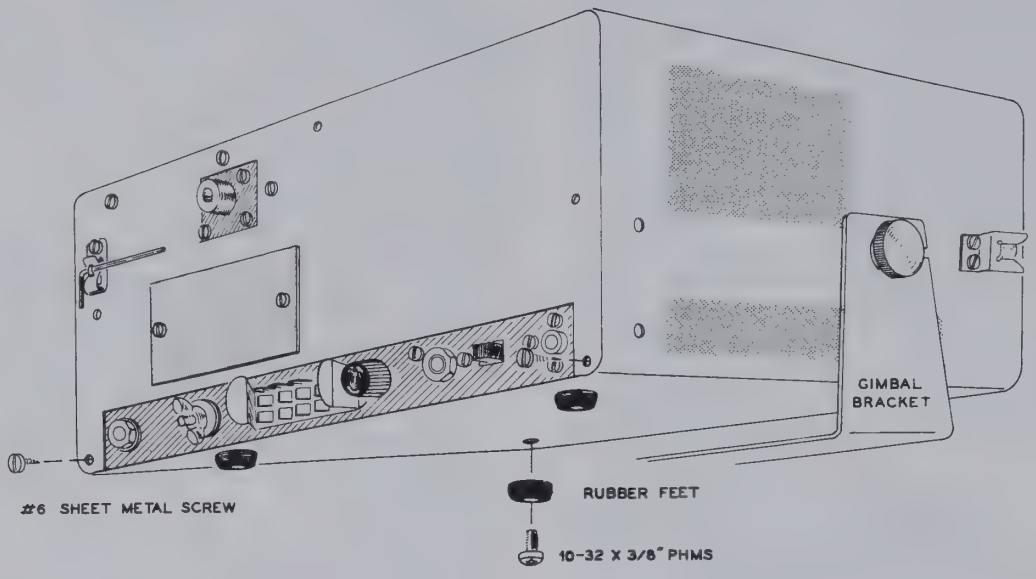
( ) Secure the rear apron to the back of the cabinet. Use two #6 sheet metal screws.

( ) Mount the crystal access plate to the back of the cabinet. Use two 6-32 x 1/4" screws.

This completes installation of parts and the main chassis in the cabinet. If fixed station rather than mobile operation is desired, skip the next section of the manual and refer forward to Operation on Page 119.

Detail 38C





Pictorial 39

MOBILE POWER CABLE WIRING

The HEATHKIT "Shawnee" Transceiver may be used with either 6 volt or 12 volt automotive systems. The only requirement is that the DC power connector socket be wired for the proper DC voltage that the unit will operate on. Also the primary fused relay is designed for 6 volt DC operation and a 16 Ω, 24 watt resistor is supplied for 12 volt DC operation of the relay.

Determine the voltage on which the unit is to operate. If the source is 12 volts, use the steps outlined under connections for 12 volt operation; if the source is 6 volts, use the steps outlined under connections for 6 volt operation.

CONNECTIONS FOR 12 VOLT OPERATION

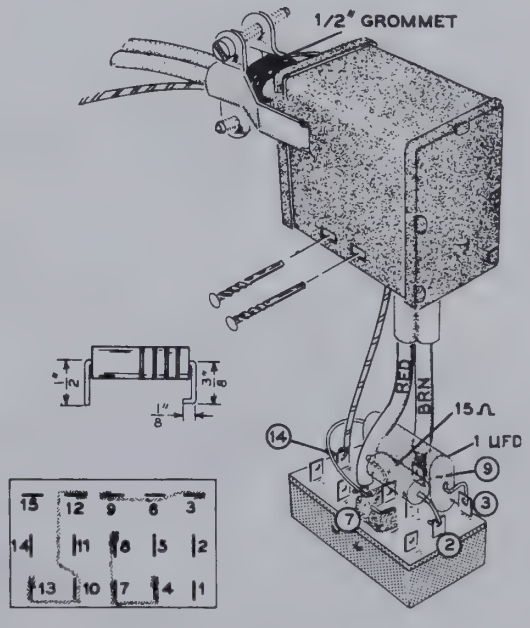
Refer to Detail 39A for the following steps.

( ) Locate the power connector socket and remove the two pins holding the housing to the socket. Position the socket as shown.

( ) Connect a length of braid from lug 12 (S-1), dress the braid as shown and place it next to lug 10 (S-2), and connect the braid end to lug 13 (S-1). Placing solder on the braid between lugs 10 and 12 will hold the braid in position. Make sure it will not short to lug 11 or 14.

( ) Connect a second length of braid from lug 9 (S-1). Then place it next to lug 6 (S-2), and connect the end to lug 3 (NS).

( ) Connect a third length of braid from lug 4 (S-1), then dress it around lug 7 (S-2), and connect the end to lug 8 (NS).



Detail 39A

( ) Strip the outer jacket from the #12 stranded, 2-conductor cable for a distance of 1-1/2". Strip both leads 1/4".

( ) Locate the remaining length of black stranded hookup wire, strip one end 3/8", and tin.

( ) Slip a 1/2" rubber grommet over the stripped ends of both the black hookup wire and the 2-conductor cable. Then insert the wires through the hole in the side of the connector housing as shown.

( ) Connect the black stranded hookup wire to lug 14 (S-1).

( ) Connect the 2-conductor cable as follows: Spread the wire strands in half on both leads. Place the red lead over the braid between lugs 4 and 7. Then solder heavily. In a like manner, connect the brown lead to the braid between lugs 6 and 9 and solder.

( ) R74. Cut both leads of the 15 Ω (brown-green-black) 2 watt resistor to 1/2" in length. Bend both leads at right angles close to the resistor body and connect one lead to lug 2 (S-1). Connect the other lead to lug 8 by placing the lead next to the lug (S-2). Position the resistor over toward lugs 4 and 7 as shown.

( ) C124. Cut one lead of the 1 μfd mylar capacitor to 1-1/4". Cut the other lead to 5/8". Position the capacitor as shown and connect the short lead to lug 3 by placing the lead next to the lug (S-2). Connect the long lead to the red lead of the 2-conductor cable by making a loop around the red lead as shown and solder.

( ) Now replace the connector socket in the connector housing with lugs 13, 14 and 15 positioned at the same end that the leads enter the housing. Secure with the two pins supplied with the connector socket. Gently tap the pins in place until the ends protrude through the other end of the housing.

( ) Position the rubber grommet under the connector clamp and tighten the clamp with the two screws.

CONNECTIONS FOR 6 VOLT OPERATION

Refer to Detail 39B for the following steps.

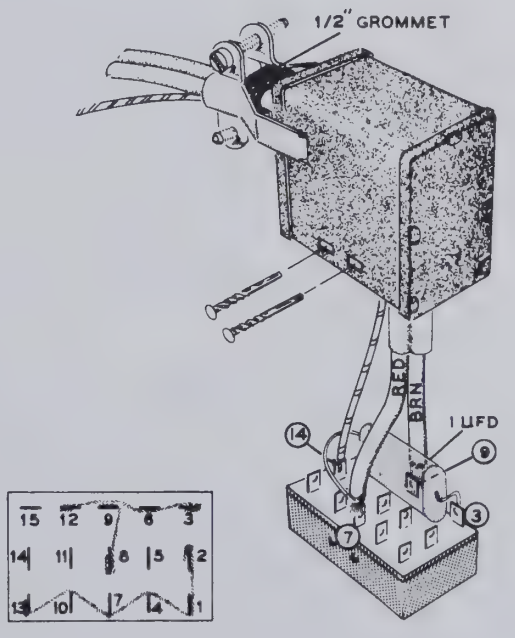
( ) Locate the power connector socket and remove the two pins holding the housing to the connector socket. Position the socket as shown.

( ) Connect a short length of braid from lug 8 (S-1) to lug 9 (NS).

( ) Connect a length of braid from lug 2 (S-1), dress as shown, going around lug 1 (S-2), then over to lug 4 (S-2), lug 7 (NS), lug 10 (S-2), and connect the end to lug 13 (S-1). Solder all connections heavily.

( ) Connect a length of braid from lug 12 (S-1), dress as shown, placing the braid next to lug 9 (NS), then next to lug 6 (S-2), and connect the end to lug 3 (NS).

( ) Strip the outer jacket from the #12 stranded, 2-conductor cable for a distance of 1-1/2". Strip both leads 1/4".



Detail 39B

( ) Locate the remaining length of black stranded hookup wire, strip one end 3/8", and tin.

( ) Slip a 1/2" rubber grommet over the stripped ends of both the black hookup wire and 2-conductor cable. Then insert the wires through the hole in the side of the connector housing as shown.

( ) Connect the black stranded hookup wire to lug 14 (S-1).

( ) Connect the 2-conductor cable as follows: Spread the wire strands in half on each lead. Place the red lead over lug 7 and next to the braid (S-3). Place the brown lead over lug 9 (S-4).

( ) C124. Cut one lead of the 1 μfd mylar capacitor to 1-1/4". Cut the other lead to 5/8". Position the capacitor as shown and connect the short lead to lug 3 by placing the lead next to the lug (S-2). Connect the long lead to the red lead of the 2-conductor cable by making a loop around the red lead as shown and solder.

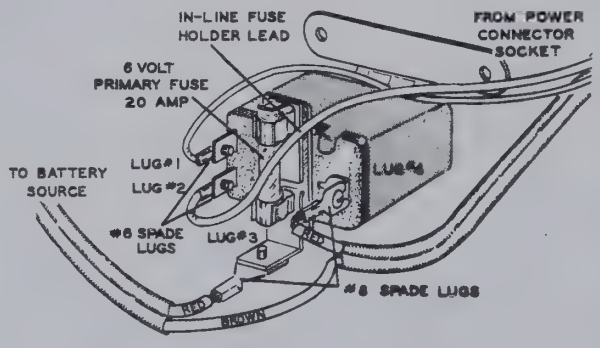
( ) Now replace the connector socket in the connector housing with lugs 13, 14, and 15 positioned at the same end that the leads enter the housing. Secure with the two pins supplied with the connector socket. Gently tap the pins in place until the ends protrude through the other end of the housing.

( ) Position the rubber grommet under the connector clamp and tighten the clamp with the two screws.

POWER CABLE AND RELAY INSTALLATION

In most automobiles there is a preformed rubber grommet located on the firewall that passes the automotive electrical cable assemblies. In most cases there are spare holes in this grommet which can be used for routing the Transceiver's power cable into the engine compartment. In some automobiles there are knock-outs on the firewall which can be used.

Study Pictorial 40, and for 6 volt systems Detail 40A. The only difference between the 6 volt and 12 volt installation of the relay is the addition of the 16 Ω resistor, resistor mounting bracket, and assorted hardware. In either case, locate the relay as close as possible to the storage battery. When mounting the relay, mount the unit on its side or with the fuse and lugs facing downward. DO NOT MOUNT IN AN UPRIGHT POSITION. The relay is not water tight and over a period of time could collect water in the relay housing, consequently damaging the relay.



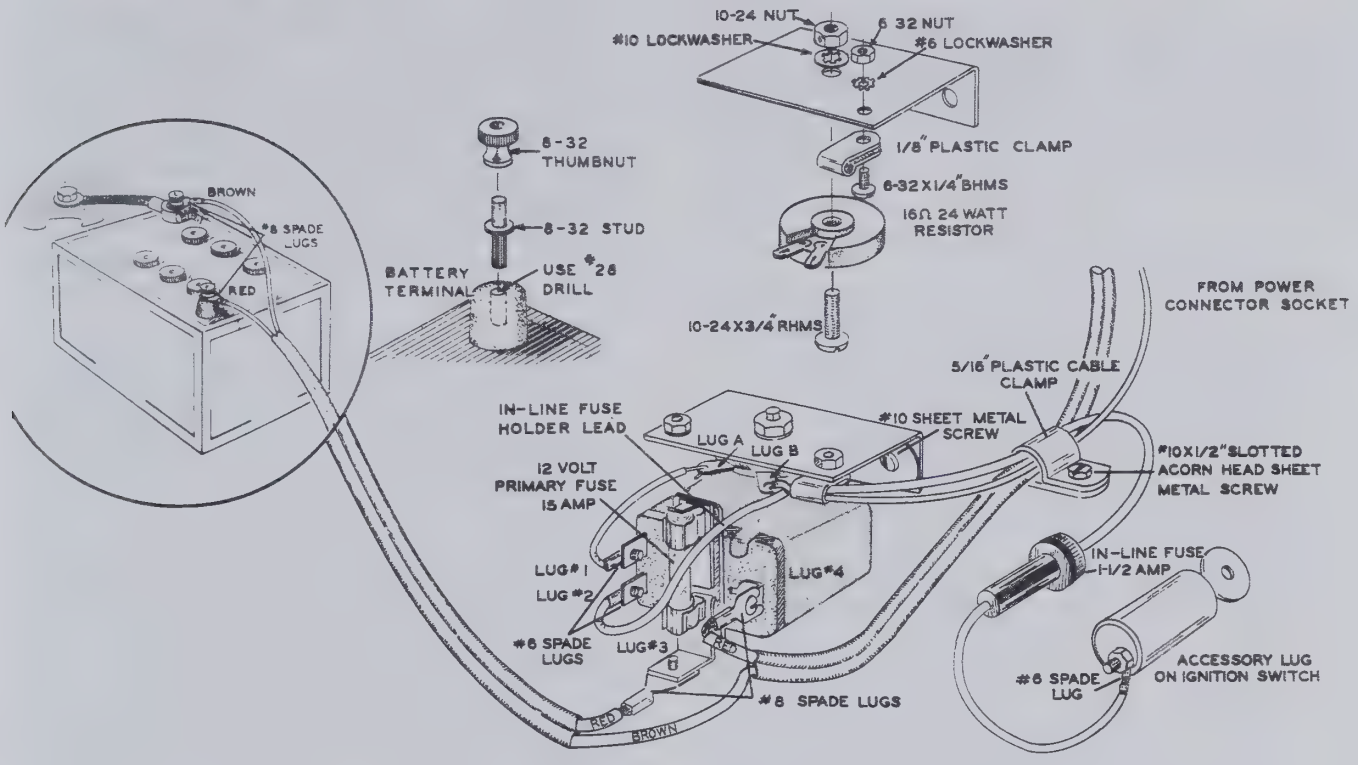
Detail 40A

( ) When a location has been found for the relay, use the relay mounting flange as a template and center punch or mark through the two holes on the flange, on the surface that it will be mounted to.

( ) Use the #28 twist drill supplied with the kit and drill a hole at each of the marked positions.

( ) Also use the #28 drill and drill holes in the center of each battery terminal to a depth of 1/2" to 5/8".

( ) Place an 8-32 thumbnut on each of the two 8-32 studs. Then gently tap each stud into the battery terminals.



Pictorial 40

12 VOLT SYSTEMS

( ) Locate the resistor mounting bracket (#204-M348) and mount the 16 Ω 24 watt resistor, using the 10-24 x 3/4" screw, #10 lockwasher, and 10-24 nut. Position the lugs as shown.

( ) Mount the relay and resistor mounting bracket at the location of the two holes just drilled, using two #10 x 1/2" slotted acorn head sheet metal screws.

Detail 40B

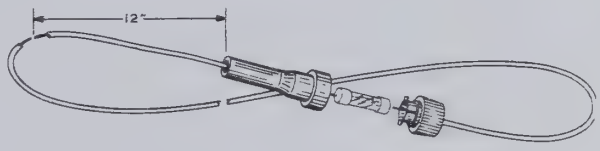
( ) Cut a length of stranded black hookup wire to 2-1/2" and strip both ends 3/8". Solder a #6 spade lug on one end. See Detail 40 B.

( ) Fasten the spade lug of the jumper wire at lug 1 of the relay. Connect the other end to lug A of the resistor (S-1).

6 VOLT SYSTEMS

( ) Mount the relay at the location of the two holes just drilled, using two #10 x 1/2" slotted acorn head sheet metal screws.

( ) Locate the in-line fuse holder and refer to Detail 40C. Cut the lead as indicated and strip each end 3/8".



Detail 40C

( ) Solder a #6 spade lug on the short length of wire from the fuse holder. See Detail 40B.

NOTE: Pictorial 40 shows the fuse holder line connected to the accessory lug on the ignition switch as is recommended for increased vibrator life. It also avoids a dead battery if the Transceiver is left on when leaving the automobile. In those cases where an accessory position is not available, then connect the lead to

the hot lug of the ignition switch. Do not connect to the ignition coil side of the switch. This will lead to burned up distributor points and possible ignition coil damage if operation of the Transceiver is attempted without the engine running.

( ) Fasten the spade lug to the accessory lug on the ignition switch.

( ) Now pass the 2-conductor cable and the black stranded hookup wire from the power connector socket along with the fuse holder lead, out through the firewall and dress over to the relay. IMPORTANT: Keep these leads as far away as possible from the spark plug leads, distributor and engine manifold.

( ) Supplied with the kit are six 5/16" plastic cable clamps to hold the power cables in place. Use the #28 drill for the holes and #10 x 1/2" slotted acorn head sheet metal screws to secure the cable clamps in place where needed. Be sure to leave enough cable length inside the driver compartment so the power connector socket can reach the Transceiver.

( ) At the relay end of the power cables, clip off the excess length on the black wires, leaving sufficient length to reach the relay lugs. Strip each end 3/8" and solder a #6 spade lug on the lead from the in-line fuse holder (large diameter black wire).

( ) Fasten the #6 spade lug connected to the fuse holder lead to lug 2 of the relay.

( ) 12 volt system: Connect the black stranded hookup wire from the power connector socket (small diameter black wire) to lug B of the 16 Ω resistor (S-1).

( ) Place the remaining 1/8" plastic cable clamp over the two black leads and secure it to the resistor mounting bracket, using 6-32 hardware as shown.

( ) 6 volt system: Solder a #6 spade lug on the other black lead (small diameter black wire) and fasten it to lug 1 of the relay.

( ) Dress the 2-conductor cable near lugs 3 and 4 of the relay. See Pictorial 40 on Page 117. Then remove 2" of the outer jacket from the cable where it is positioned near the relay lugs. Cut the red lead at the center and strip both ends 3/8". Solder a #8 spade lug on each stripped lead.

( ) Fasten the #8 spade lug connected to the red lead coming from the power connector socket to lug 4 of the relay.

( ) Fasten the other spade lug to lug 3 of the relay.

( ) Dress the remaining length of 2-conductor cable over to the storage battery. Clip off any excess length, leaving sufficient length so that when the two conductors are separated, they both can reach the battery terminals.

( ) Remove the necessary length of outer jacket from the cable and strip both leads 3/8".

( ) Solder a #8 spade lug to each lead.

( ) Fasten the spade lug connected to the brown lead to the battery terminal that is grounded.

( ) Fasten the other spade lug from the red lead to the HOT battery terminal.

( ) 12 volt system: Install a 15 ampere fuse in the relay fuse holder.

( ) 6 volt system: Install a 20 ampere fuse in the relay fuse holder.

( ) Install a 1-1/2 ampere fuse in the in-line fuse holder.

( ) Plug the power connector socket into the connector plug on the Transceiver and apply power to the unit by turning the AUDIO gain control on. Be sure to turn the ignition switch to the accessory position if used.

( ) Plug an antenna into the unit and check the Transceiver for proper operation. On 12 volt systems, check all tubes and pilot lamps for proper filament operation. If only a portion of the tubes are lit, turn the unit OFF and recheck the power connector socket wiring. Before turning the transmitter section on, refer to the discussion of antennas on Page 124.

This completes installation for mobile operation.

OPERATION

NOTE: IT SHOULD BE NOTED THAT AN AMATEUR RADIO OPERATOR AND STATION LICENSE IS REQUIRED TO PLACE THIS TRANSCEIVER ON THE AIR. Information regarding licensing and amateur frequency allocations may be obtained from publications of the Federal Communications Commission or the American Radio Relay League.

FUNCTION OF OPERATING CONTROLS

Refer to Pictorial 31 on Page 93 for identification of all controls.

DIAL SCALE: The dial has two scales, with both scales divided into forty-four 100 kc segments. Five long dial marks divide the scale into four 1 mc segments. The wide base line between 50.0 - 50.1 mc shows that portion of the band for A1 type of emission only. Outside the Amateur band at the low end of the dial scale are representative marks for MARS operators. The top scale is calibrated for use with the VFO and exciter stages of the transmitter with the bottom scale calibrated for use with the receiver section of the Transceiver.

RCVR TUNE: This control tunes the receiver across the 6-meter band and operates the dial pointer across the RECEIVER dial scale.

XMTR TUNE: This control tunes the VFO and all exciter stages and operates the dial pointer across the TRANSMITTER dial scale.

AUDIO/PWR OFF: Turning the control clockwise from the extreme counterclockwise position turns the unit on and controls the AC or battery power for the entire unit (117 V AC, 12 V DC, or 6 V DC). Advancing the control further in a clockwise direction increases the volume of the receiver.

X1-X2-X3-X4-VFO: This control selects either VFO or one of four crystal socket positions for frequency control of the transmitter. Looking from the front of the unit, the left-hand crystal socket corresponds to the X1 position of the switch, with the second crystal socket from the left corresponding to X2, etc.

RF GAIN: The control is normally turned fully clockwise for maximum sensitivity of the receiver. When a very strong signal is received, the sensitivity of the receiver can be reduced by turning the control counterclockwise until satisfactory reception is obtained.

BFO PITCH: The Beat Frequency Oscillator circuit is turned ON by pulling the control knob out. The pitch of the BFO is varied by turning the control either clockwise or counterclockwise. The control is normally set with the red arrow on the knob straight up.

ANL/SQUELCH: The Automatic Noise Limiter circuit is turned ON by pulling the control knob out. This circuit is effective in reducing pulse-type noise such as ignition and other electrical disturbances. With the ANL control ON, AVC action is reduced slightly. The SQUELCH control is normally set fully counterclockwise. When quieting of the receiver is desired, adjust the AUDIO gain control for a normal listening level, then advance the SQUELCH control in a clockwise direction just until the background noise becomes inaudible with no signal present. The SQUELCH control becomes inoperative when the AVC switch is placed in the OFF position.

FINAL TUNE: This control resonates the final tank circuit and is tuned for a maximum meter indication when the transmitter is energized.

AVC/OFF-ON Switch: The Automatic Volume Control circuit when turned ON maintains the receiver output level fairly constant regardless of input signal variations. When listening to weak CW or SSB signals, the AVC switch should be turned to the OFF position. The AVC has to be ON for SQUELCH operation and receiver meter indication.

SPOT/OFF-ON Switch: Placing the spot switch at the ON position energizes the VFO and/or crystal oscillator stage providing a signal that can be picked up on the receiver. With the crystal-VFO selector switch at the VFO position, the SPOT signal can be used to zero on an incoming signal on the receiver. With the crystal-VFO selector switch at one of the crystal socket positions (X1, X2, etc.), then the

SPOT signal heard on the receiver can be used to properly adjust the exciter stages to the crystal frequency by turning the XMTR TUNE control for maximum meter indication. When the SPOT signal is not in use, the switch should be left at the OFF position.

AM-CW Switch: Placing this switch in the CW position disables the modulator and energizes the transmitter. The transmitter may be keyed by inserting a key in the key jack on the rear apron. Leaving the switch in the AM position and depressing the push-to-talk button on the microphone energizes both the modulator and transmitter for a voice modulated signal. The switch must be placed in the AM position for receiver operation.

METER: During receive operation and with the AVC switch placed at the ON position, the meter reads the relative signal strength of the received signal. When the transmitter is energized for either the AM or CW mode of operation, the meter circuit is automatically switched and reads the relative power output of the transmitter. In the AM mode of operation the meter also indicates upward swings with applied modulation, informing the operator that modulation is present on the carrier.

COUPLING: This is a screwdriver adjustment located behind the XMTR TUNE knob and controls the amount of link coupling to the final tank coil. It is adjusted for maximum meter indication along with the FINAL TUNE control.

LOADING: This also is a screwdriver adjustment located behind the XMTR TUNE knob and tunes out any reactance in the link. It is also adjusted for maximum meter indication along with the LOADING and FINAL TUNE controls.

MOD. LEVEL/PA: Located on the rear apron of the chassis this control when pushed in and turned in a clockwise direction increases the amount of modulation on the transmitted carrier. With the control pulled out, B+ power is removed from the transmitter section. An external speaker of 8 Ω impedance rated at 15 watts can be plugged into the PA SPKR jack. Depressing the mike button allows paging or PA operation. Also the receiver may be monitored by this method.

MOD. MONITOR: Placing the switch to the ON position and plugging a set of headphones into the PHONES jack allows monitoring of the modulation on the RF carrier. The switch is normally left in the OFF position.

PHONES: Inserting a headphone plug into this jack disables the internal speaker and applies the receiver audio to the headphones.

KEY: Inserting the plug of a key into this jack and placing the AM-CW switch in the CW position allows CW operation of the transmitter. The key may be left in the KEY jack but in a closed position for AM operation.

NOISE SUPPRESSION

If fixed station, rather than mobile operation, is intended, skip this section and refer forward to Type Of Antennas on Page 124.

The HEATHKIT "Shawnee" Transmitter-Receiver combination has an excellent automatic noise-limiter circuit included in its design. This circuit will limit most electrical interference. However, the noise limiter should not be given too much work to do as at high engine speeds, a noisy ignition system, generator "whine," and voltage regulator "hash" will tend to mask weak signals, although with the limiter working, the interference may appear to be completely eliminated.

Another reason for good electrical interference suppression at the source is that strong electrical pulses contain enough energy when integrated to block the AVC circuit of the receiver, causing the gain to drop whenever the engine is speeded up. In addition, the IF amplifiers of the receiver will also tend to lengthen the duration of the noise pulses because the relatively high-Q IF tuned circuits will ring or oscillate when excited by a sharp pulse, such as produced by ignition noise.

Determining the source of various types of noise can be difficult, particularly when several items are contributing to the noise. To isolate and identify the various items that may be producing the major noise interference, follow the procedure outlined below.

In some cases one source of interference will mask all others, consequently it will be necessary to suppress the questionable item and then continue with the other steps. Figure 23 shows a typical ignition system and the suggested placement of noise suppression components.

1. Locate the vehicle in an area that is free from other man-made electrical interference such as power lines, manufacturing processes, and particularly other automobiles.

2. With the Transceiver on and the ANL switch off, run the automobile at medium speed. Then let up on the gas, turn the ignition switch off and to the accessory position. Allow the vehicle to coast in gear. If all noise stops, the major source of interference is from the ignition system.

3. If the noise interference continues from step 2, but at a reduced level, both the ignition and generator systems are at fault.

4. If the noise has a "whine" characteristic and changes in pitch when varying engine speed and is still present with the ignition off, then the generator is the major source of interference.

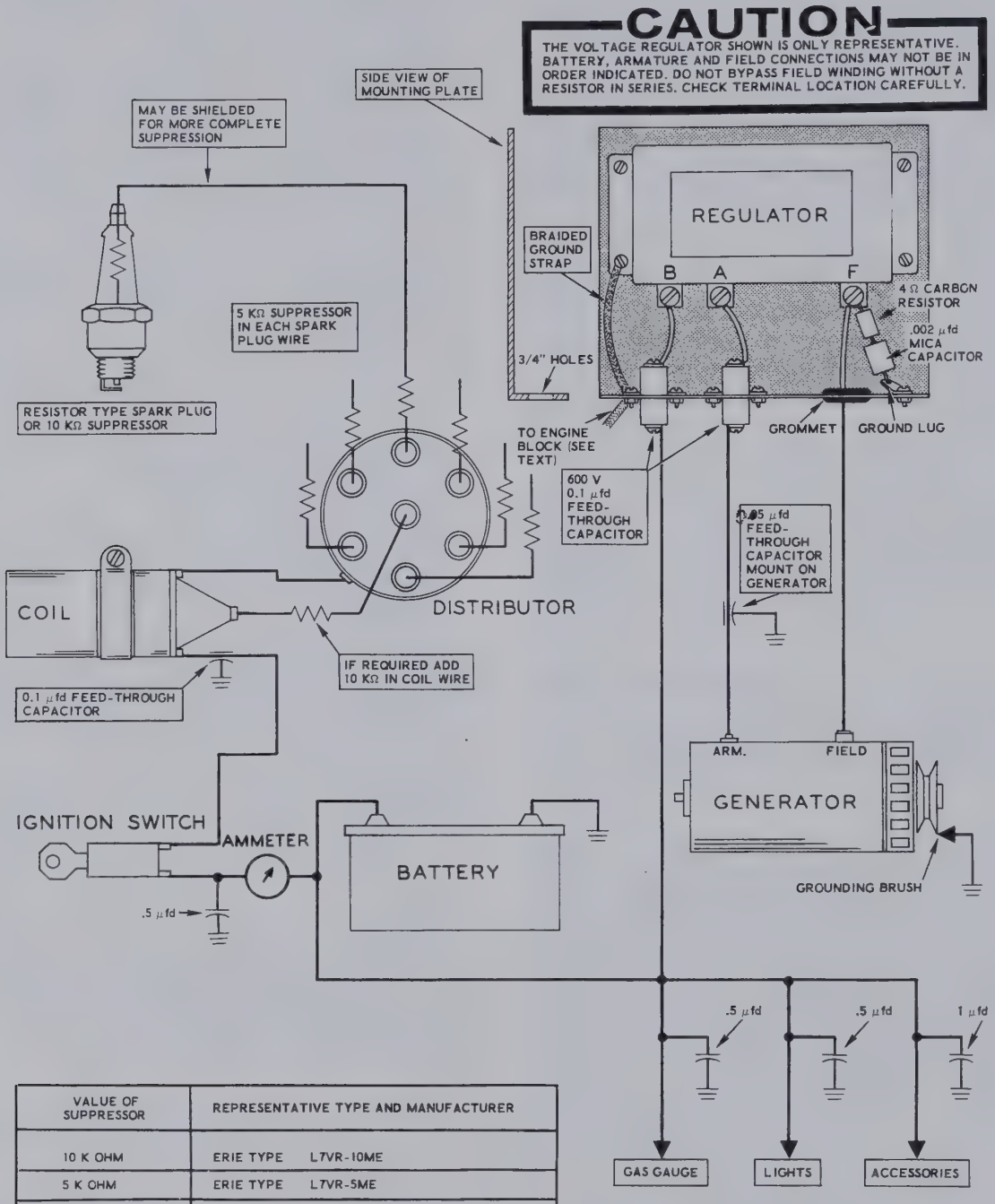
5. A distinct but irregular clicking noise, or "hash" as it is sometimes called, that disappears with the ignition off, indicates the voltage regulator is at fault.

6. A steady popping noise that continues with the ignition off indicates wheel or tire static interference. This is more pronounced on smooth roads.

7. The same type of interference as in step 6, but more irregular when on bumpy roads, particularly at slow speeds, indicates body static.

Reference to the Troubleshooting Chart on Page 123 and to Figure 23 on Page 122 will help in determining how to suppress most of the noise interference encountered. Naturally, not all vehicles will require suppression to the extent shown in Figure 23, but some stubborn cases may require all the suppression components as shown, plus shielding of the ignition system.

Bonding of various parts of the automobile, starting from the hood and continuing to the trunk, even including bonding of the transmission line every few feet from the antenna cannot be overemphasized.



VALUE OF SUPPRESSOR	REPRESENTATIVE TYPE AND MANUFACTURER	
10 K OHM	ERIE TYPE	L7VR-10ME
5 K OHM	ERIE TYPE	L7VR-5ME
0.5 MFD FEED-THROUGH	SPRAGUE	48P18 (40 AMP)
0.1 MFD FEED-THROUGH	SPRAGUE	80P3
.5 MFD	MALLORY	AG-451
1 MFD	MALLORY	AG-452

NOTE ALL GROUND CONNECTIONS SHOULD BE MADE TO THE COMPONENT BEING BYPASSED, PREFERABLY MOUNTED DIRECTLY ON IT.

Figure 23

TROUBLESHOOTING CHART

TYPE OF NOISE	PROBABLE CAUSE	RECOMMENDED REMEDY
Loud popping increasing to buzz with increased engine speed.	Ignition system.	1. Replace plugs with resistor type. (Most recommended.) 2. Loose crimped connections should be cleaned and soldered. 3. Place resistors in distributor system.
Whine - varies with engine speed.	Generator.	1. 0.1 μfd coaxial type capacitor in series with the armature (A lead). 2. Clean commutator. 3. Replace brushes. 4. Ground generator shaft. 5. Parallel trap (#10 wire-coil and suitable capacitor) in series with armature lead, tuned to operating frequency.
Distinct but irregular clicking noise.	Voltage regulator.	1. 0.1 μfd coaxial type capacitor in series with the battery (B) and armature (A) leads. 2. A series combination of a .002 μfd mica capacitor and a 4 Ω carbon resistor to ground from the field (F) terminal. All components should be mounted as shown in diagram, close to voltage regulator.
Same as above.	Energy transfer to primary system.	1. Bypass at the following points: coaxial bypass in lead to coil from ignition switch (0.1 μfd). Battery lead to ammeter (.5 μfd); to gas gauge (0.5 μfd); to oil signal switch (0.5 μfd); head and tail light leads (.5 μfd); accessory wiring from engine compartment (.5 μfd).
Loud popping noise that changes from one type road to another. Most pronounced on concrete.	Wheel static.	Installation of front wheel static collectors (available from most automotive distributors). These should be checked every 5000 miles for excessive wear.
Same as above.	Tire static.	Injection of anti-static powder into tire through valve stem.
Irregular popping noise when on bumpy roads, particularly at slow speeds.	Body static.	Tighten all loose screws. Use heavy flexible braid and bond the engine to the frame and fire wall. Bond the control rods, speedometer cable, exhaust pipes, etc., to the frame.

It is recommended that if an extensive amount of suppression was required, the engine should be retimed and tuned up at a reputable garage.

For further information on vehicular noise suppression, see the Bibliography on Page 133.

TYPES OF ANTENNAS

A collapsible whip antenna and loading coil is supplied with the Transceiver and is intended primarily for portable application where short-range communication is desired. The antenna can be plugged directly into the antenna coaxial jack at the rear of the cabinet and extended out to approximately its full length.

Locate the antenna parts that were set aside when checking the Parts List. Assemble these parts as shown in Figure 24.

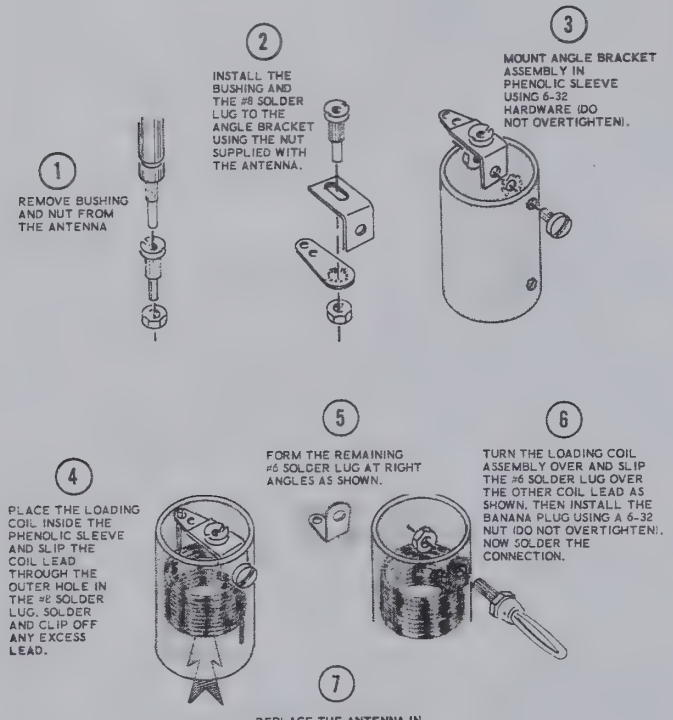


Figure 24

With the collapsible whip extended to its full length (38-1/2") the antenna and loading coil combination are resonant at the low end of the 6-meter band. Collapsing only the top section completely tunes the antenna system approximately at 54 mc. If there appears to be a slight mismatch of the antenna at the operating frequency, merely extend or collapse the whip until proper loading takes place.

For fixed station operation a good beam antenna is recommended. Regardless of the type of antenna used, it is extremely important that it be installed as high as possible for best results.

Various types of antenna designs exist which differ in complexity, directional characteristics, polarization and cost. The simplest of the horizontally polarized type is shown in Figure 25, and is generally referred to as a "dipole" or "doublet." Its directional characteristics are not very pronounced and represent an approximate "figure eight" pattern. The antenna as shown is properly fed with 75 Ω ribbon line (special twin lead), although doublets are frequently fed with 75 Ω coax with good results.

Simple, practical antennas for vertical polarization are the "ground plane" and "coaxial" types, either of which is essentially omni-directional, that is, they radiate equally well in all directions in the horizontal plane.

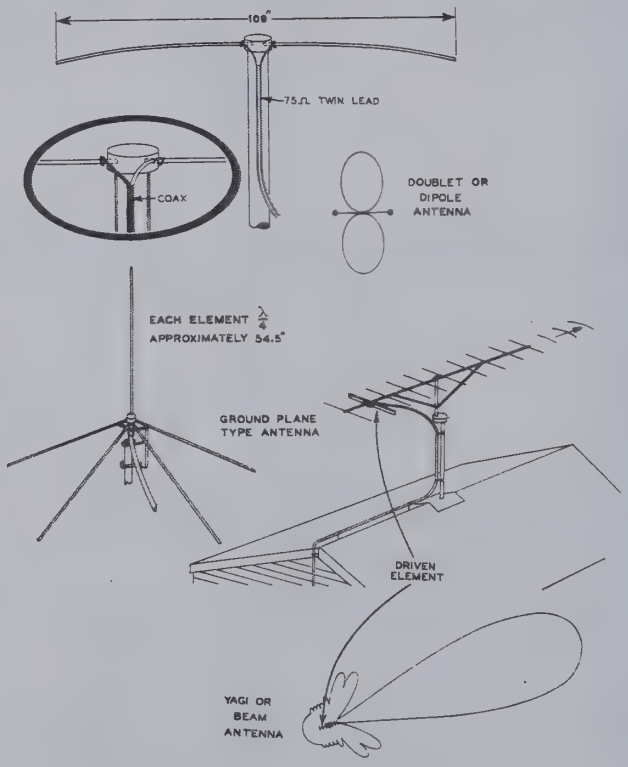


Figure 25

The choice of polarization is largely a sectional one. Some areas are predominately horizontal where others are vertical and it is suggested you use the polarization generally in use in your area. Beam antennas will provide typical effective radiated power gains up to 50 or 60, depending upon the number of parasitic elements used.

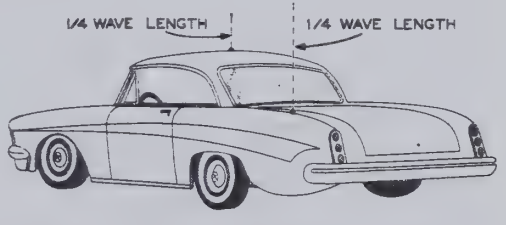
This means in effect that both transmitted and received signals will be up to 50 to 60 times stronger in signal strength (in the direction of maximum radiation) than when a simple doublet is used.

In viewing Figure 25, it is apparent that some means of turning the antenna is required unless point-to-point communication is the only requirement. Most any of the inexpensive television antenna rotors are adequate for a single bay beam of reasonable length on 6 meters.

The choice of a directional antenna versus an omni-directional one is largely dependent upon application. Where strong signals are consistently present or where it is undesirable to have to rotate the antenna, the simpler types of antennas lend themselves readily. The highly directional arrays find good application in weak signal communications, point-to-point communications, or where it is desirable to reject signals from other interfering stations by rotating the antenna. It should be pointed out though, that even at short ranges it is usually difficult to communicate between two stations, if one is horizontally polarized and the other is polarized vertically.

In a mobile installation, the antenna system is of great importance. Any mobile system is at a decided disadvantage, due to the lack of a good earth ground, the only ground being the capacitive coupling between the vehicle body and the earth below.

Figure 27



With few exceptions, the antenna best suited for mobile service will be either some sort of vertically polarized whip antenna (Figure 27) or the current "halo" antenna for horizontal polarization. It is suggested that you contact hams in your area to determine the type of polarization used in your locality, since some areas prefer one over the other and it becomes very difficult to maintain communication under cross-polarization conditions at this frequency. For vertical polarization, a 1/4 wave (approximately 54.5") whip, suitably placed, as shown in Figure 27, is generally the most practical. These antennas use the metal vehicle body as their "ground plane" and for this reason are normally somewhat directional when installed in a more practical location, such as the rear of the vehicle. If installed in the roof center, radiation is usually better and very little directional properties will be noted. No specific information about the actual directional characteristics of any given installation can be given here due to variables in antenna location, but a typical installation might be expected to yield a radiation pattern similar to that shown in Figure 28.

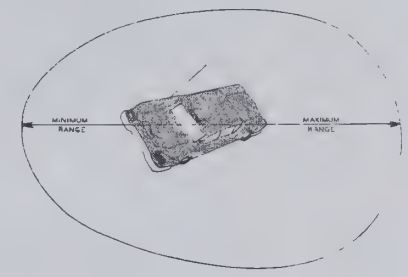


Figure 28

This directional characteristic normally causes no serious difficulty, but you should be aware of its existence.

ANTENNA FEED OR MATCHING SYSTEM

The antenna connector on your "SHAWNEE" is designed for an unbalanced transmission line of

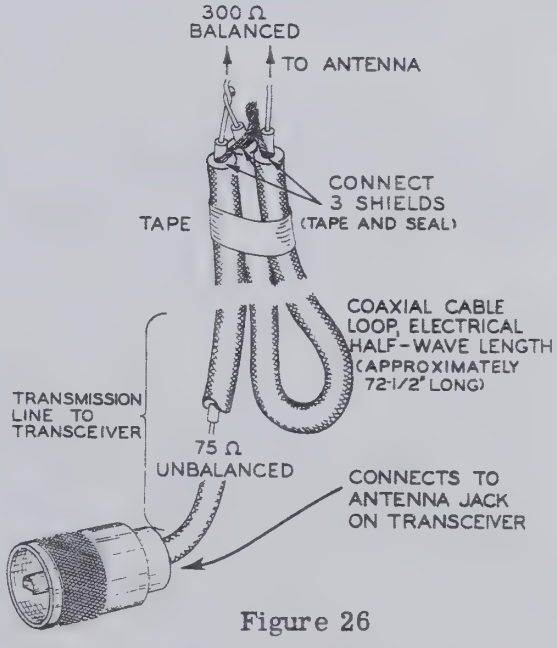


Figure 26

50-75 ohms (coaxial cable). Frequently antenna systems are designed to be fed with 300 Ω twin lead or "ladder lines." A simple balun system shown in Figure 26 or Figure 26A, will provide the conversion from a 75 Ω unbalanced to 300 Ω balanced line and may be used at either end of the transmission line. The balun also may be made of 50 Ω coax to match 200 Ω balanced lines such as the K200 low loss twin lead.

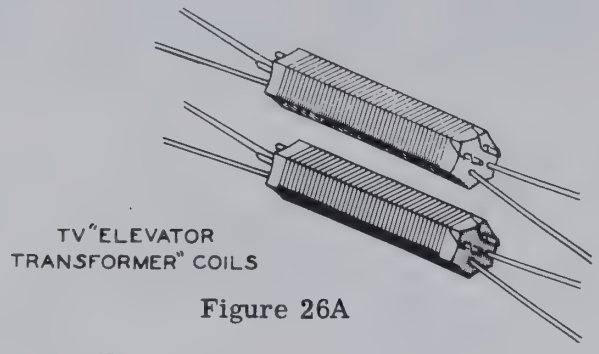


Figure 26A

For normally short runs of transmission line, either coax or twin lead may be used. For long runs, coax will have considerably more loss than twin lead or ladder line. If twin lead transmission line is used to the antenna, the coil type balun (Figure 26A) will work well. If the balun is used at the antenna (using coax as the transmission line), the coaxial balun (Figure 26) is preferred due to its exposure to outdoor conditions.

Figure 26B is a schematic view of a balun coil.

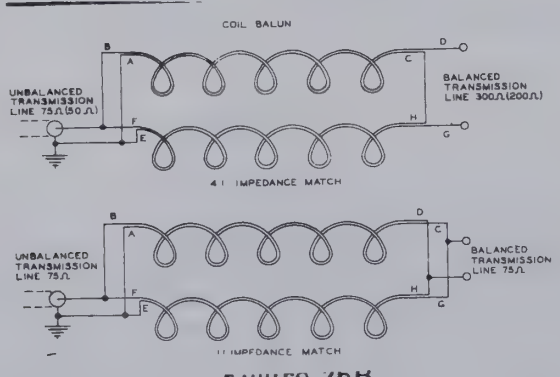


Figure 26B

It should be pointed out that vertical 1/4 wave whips and most "halo" antennas will match 50 Ω coaxial transmission lines.

VFO DIFFERENTIAL CAPACITOR ADJUSTMENT

The VFO differential capacitor C76 is made adjustable to change the amount of negative temperature compensation in the VFO circuit. If it is found that the VFO frequency has a slight drift upward in frequency, adjust the differential capacitor C76 in a clockwise direction about 1/8 of a turn from the reference position given on Page 106 under VFO Preset Adjustments. If the frequency drift is downward in frequency, adjust C76 in a counterclockwise direction about 1/8 of a turn. It may be necessary to touch up VFO calibration after adjusting the differential capacitor.

GROUNDING

For fixed station operation, proper grounding techniques are very important at these frequencies. A flexible braid or copper strap at least 1/2" wide should be connected to the ground lug of the Transceiver located on the rear apron of the chassis and connected to a ground rod which extends into the earth at least 6 feet. Make the run as short and direct as possible. If the Transceiver location and ground rod are over a half-wave length away from each other at the operating frequency, a system of three or more grounding straps, each one a different length, should be connected to the ground rod. Do not use gas pipes, electrical conduit, or water pipes that are a part of the structure of a dwelling. Water pipes are not necessarily good grounds, because of the pipe compound used on pipe joints and the corrosion that develops between the joints.

IN CASE OF DIFFICULTY

Mistakes in wiring are the most common cause of difficulty. Consequently, the first step is to recheck all wiring against the pictorials and schematic diagrams. Often having a friend check the wiring will locate an error consistently overlooked.

With miniature sockets, there is a possibility of shorts between adjacent socket terminals due to the close spacing. This should be checked and if any doubt exists, the terminals should be pried apart until obvious spacing can be seen between them. This is also true of the miniature terminal strips.

Sometimes apparently good solder connections will have an insulating coating of rosin between the wire, the terminal and the solder. This is often the case when insufficient heat was applied in soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as illustrated in the Proper Soldering Techniques section of the manual. Naturally, all voltages should be "off" for such tests. As additional insurance against shock, a screwdriver blade should be used to short from the chassis to the hot (+) ends of all electrolytic filter capacitors.

The Transceiver is fused at the line cord plug for AC operation and at the primary relay for mobile operation. A 3AG type fuse is required on each side of the line plug with a rating not in excess of 1-1/2 amperes. A 15 ampere fuse is required for 12 volt systems and a 20 ampere fuse for 6 volt systems. The fuse is installed at the primary relay for mobile operation. Should you find that fuses consistently blow whenever the power connector sockets are plugged into the unit and the AUDIO control is in the PWR OFF position, recheck the power connector socket wiring. See Pages 114 and 115. Also refer back to Preliminary Operation Checks on Page 95.

If fuses blow instantly when power is applied to the unit, make resistance checks of the power supply, B+ circuits, and filament circuits. Check all tubes for possible shorts.

Also check the tube locations to be sure that all tubes are in their proper locations. On AC, if removing the vibrator allows proper operation, check the vibrator and associated circuitry. On DC operation, check the vibrator, primary relay, and power cable wiring.

Be sure to reread the Circuit Description so that "Cause and Effect" reasoning may be employed as the search for trouble progresses. If some difficulty still persists after the steps outlined below have been completed, attempt to localize the trouble to a particular stage in the Transceiver circuit. Use the voltage and resistance charts on Page 138 and 139 as a basis for localization; refer to the block diagram and schematic to visualize circuit relationships.

A grid dip meter or wave meter and signal generator or crystal calibrator are ideal instruments for checking the RF circuits of both the receiver and transmitter sections. Last, but not least, a volt-ohm-milli-ampere meter (preferably 20,000 ohm/volt) should be available for measuring voltage, resistance, and current.

Due to the complexity of the "SHAWNEE" Transceiver, certain difficulties could arise. Outlined on the next 4 pages are some of the possible indications of improper operation and their causes.

NOTES:

In order to localize trouble, use of the voltage and resistance charts on Page 138 and 139 is quite helpful, and necessary.

All voltage tests in the In Case Of Difficulty section are made with unit operating from an AC power source.

On 12 volt operation it is imperative that tubes not be pulled indescriminately, as damage may result from prolonged unbalance of filament string. Also see Page 132 for emergency use when on 12 volt operation.

Tests made on transmitter stages are made with AM-CW switch in CW position and, except for the final amplifier, with the two leads disconnected from FT-14, to avoid damage to the 6360 tube. (Make sure these leads do not short to chassis.)

Dummy load should be used for tests made on final amplifier section of transmitter.

RECEIVER CHECKS	
SYMPTOM	PROBABLE CAUSE
Pilot lamps do not light. Filaments do not light.	Open fuse in power plug. Power switch incorrectly wired. AC power cord incorrectly wired. Power transformer incorrectly wired in circuit.
No audio output at speaker.	Poor connection at speaker. AVC switch incorrectly wired. SQUELCH control incorrectly wired (try removing tube). AM-CW switch incorrectly wired. MOD. MONITOR switch incorrectly wired or in ON position. Driver or modulation transformer incorrectly wired in circuit. Relay contacts 7, 8, and 9 or PA transmit switch incorrectly wired or dirty contacts. (See Page 132 under Relays.) No receiver B+ (see power supply checks).
2 mc signal not detectable.	AVC switch incorrectly wired. RF GAIN control incorrectly wired. Diode from lug 2 of IF-4 reversed. IF-2, 3, or 4 mounted with green mark in wrong position.

SYMPTOM	PROBABLE CAUSE
Beat note not obtainable from BFO.	BFO control incorrectly wired. Coil L-8 green mark in wrong position. .56 μμf capacitor connected to wrong lug of IF-4. No regulated B+ (see power supply checks).
22 to 26 mc signal not detectable	Oscillator not properly tracked. IF-1 green mark in wrong position. Coil L-7 green mark in wrong position. TC-2, 3 or 4 incorrectly wired in circuit.
50 mc signal not detectable.	RFC-3 not soldered at FT-5. XTAL oscillator incorrectly tuned. RF GAIN control incorrectly wired or in extreme CCW position. RFC-4 shorted to receiver subchassis. Coaxial cable from antenna relay shorted or open. Antenna relay RL-2 incorrectly wired or dirty contacts. (See Page 132 under Relays.)
Meter fails to zero.	AVC switch incorrectly wired. Relay contacts 10, 11 or 12 incorrectly wired. Meter mounted incorrectly (terminals reversed). Diodes in meter circuit reversed in polarity or interchanged. Meter zero adjust control incorrectly wired (check resistor values).

TRANSMITTER CHECKS	
SYMPTOM	PROBABLE CAUSE
No grid voltage present at 6360 with XTAL-VFO switch in VFO position.	Key jack incorrectly wired. AM-CW switch wired incorrectly. Spotting switch incorrectly wired. XTAL-VFO switch incorrectly wired. XTAL oscillator plate coil (L-11) set incorrectly. Coaxial cable from VFO housing shorted or open. Relay contacts 13, 14 or 15 wired incorrectly. VFO coil and/or trimmer capacitor set incorrectly. Trimmer capacitors for multiplier and driver incorrectly set. White and gray leads reversed at FT-18 and 19 on VFO housing. No transmitter B+ (see power supply checks).
Unable to peak grid voltage at 6360 by adjusting trimmer or padder capacitors in exciter stages.	PA switch incorrectly wired. Keying circuit incorrectly wired. Trimmer or padder capacitors incorrectly wired in circuit.
Meter does not indicate RF output.	Leads not connected at FT-14. Keying circuit incorrectly wired. AM-CW switch incorrectly wired. PA switch incorrectly wired. Antenna relay incorrectly wired. Diode reversed in RF "sniffer" circuit. Link coupling, control and final tuning not set correctly.

SYMPTOM	PROBABLE CAUSE
No modulation present under AM conditions.	AM-CW switch incorrectly wired. MOD. LEVEL control incorrectly set or wired. Relay contacts 13, 14 or 15 wired incorrectly. MOD. MONITOR switch incorrectly wired. Dummy load incorrectly assembled and/or shorted.
No RF output at antenna connection on low-pass filter.	Low-pass filter incorrectly assembled. Coaxial cable from antenna relay shorted or open. Antenna not correctly matched to 50 Ω - 75 Ω output impedance. Incorrect setting of link coupling, reactance control, and/or final tuning.
POWER SUPPLY CHECKS	
No regulated B+.	Voltage regulator tube incorrectly wired in circuit. Rectifiers open.
No receiver B+. No transmitter B+.	Rectifiers shorted. Rectifiers reversed in circuit. Transformer T-1 incorrectly wired in circuit. 75 Ω resistors R34 or R40 open.
Receiver appears to work but hum or growling sound is present.	Buffer capacitor C59 shorted. Relay contacts incorrectly wired.

NOTE: 12 VOLT DC OPERATION

When the Transceiver is operating from a 12 volt supply, DO NOT REMOVE ANY OF THE TUBES OR PILOT LAMPS WITH POWER APPLIED TO THE UNIT. Because of the series parallel filament circuit arrangement when using a 12 volt supply, removing a tube with power applied may destroy other tubes due to an increase in filament current through them.

FOR EMERGENCY USE ONLY WHEN ON 12 VOLT OPERATION.

If tube V4 or V5 has a filament burn out, the squelch tube V7 can be removed to replace V4 or V5, but at the same time remove the BFO tube V8 in order to balance the filament string.

If the detector-1st audio tube V6 has a filament burn out, the BFO tube V8 can be removed to replace V6, but at the same time remove the squelch tube V7.

If the squelch tube V7 has a filament burn out, remove the BFO tube V8.

In a like manner, if the BFO tube V8 has a filament burn out, remove the squelch tube V7.

If the VFO tube V12 has a filament burn out, remove the BFO tube V8. The transmitter section then can be operated via crystal control.

If one of the pilot lamps has a filament burn out, remove the other pilot lamp.

The removal of tubes V7 and V8 as described above still allows operation of the receiver, except that the BFO and squelch circuits will be inoperative. This is mentioned only for emergency situations. It is recommended to replace the bad tubes as soon as possible. WARNING: Always remove the bad tubes from their sockets.

On 6 volt DC or 117 volt AC operation, the interchange of V7 or V8 would not necessitate removing its counterpart in the filament circuit.

RELAYS

The relays employed in this unit ordinarily will be troublefree for several years of normal use. However, if the Transceiver is exposed to wind blown dust, difficulty may be encountered with foreign matter lodging between the contacts. Using compressed air often removes such foreign matter. If it has caused contact arcing, the contacts should be cleaned with a burnishing tool only. DO NOT TRY TO USE PAPER, FINGER NAIL BOARDS OR LIQUID CONTACT CLEANERS. Further damage of the contacts will only result by using these items.

EQUIPMENT LIST

Test equipment used in making the Specification measurements and in aligning the HEATHKIT "Shawnee" 6-Meter Transmitter-Receiver combination, Model HW-10.

GENERATORS

Measurements Corporation Model 80
Standard Signal Generator

General Radio CO., Type 1001-A
Standard Signal Generator

Masconi Instruments Ltd. TF1106/3
Noise Generator

HEATHKIT Model TS-4A
Television Alignment Generator

HEATHKIT Model TO-1
Test Oscillator

HEATHKIT Model HD-20
100 kc Crystal Calibrator

HEATHKIT Model AG-9A
Audio Generator

METERS

Jerrold Model 704B
Calibrated Field Strength Meter

HEATHKIT Model AW-1
Audio Wattmeter

HEATHKIT Model V-7A
Vacuum Tube Voltmeter

HEATHKIT Model MM-1
Multimeter

The Daven Company Type OP961
Power Output Meter

Electro Impulse Laboratory, Inc. Model PM-16
RF Wattmeter

Bird Electronic Corp. Model 43
Thruline Wattmeter

OSCILLOSCOPES

Tektronix, Inc. Type 515A

HEATHKIT Model OP-1
Professional Oscilloscope

MISCELLANEOUS

Radio Products, Inc. Model SB-12.
Panoramic Panalyzor

BIBLIOGRAPHY

VHF HANDBOOK, William I. Orr, W6SAI, and Herbert G. Johnson, W6QKI, Radio Publications, Inc., Danberry Road, Wilton, Con.

RADIO HANDBOOK, Editors and Engineers, Ltd., Summerland, California.

THE RADIO AMATEURS HANDBOOK, Headquarters Staff, American Radio Relay League, West Hartford, Connecticut.

RADIO AMATEURS' MOBILE HANDBOOK, William I. Orr, W6SAI Cowan Publishing Corp., 67 West 44th St., New York 36, New York.

SUPPRESSED IGNITION FOR TWO-WAY RADIO INSTALLATIONS (bulletin #M1544) Electronic Auto-Lite Co., Toledo, Ohio

VIBRATOR POWER SUPPLY DESIGN, P.R. Mallory and Co., Inc. Indianapolis 6, Indiana.

FREQUENCY CHART TABLE			
6-METER BAND			
VFO OR CRYSTAL FREQUENCY	DIAL READING AND OUTPUT FREQUENCY	VFO OR CRYSTAL FREQUENCY	DIAL READING AND OUTPUT FREQUENCY
8.334 MC	50.0 MC	8.683	52.1
8.350	50.1	8.700	52.2
8.366	50.2	8.716	52.3
8.383	50.3	8.733	52.4
8.400	50.4	8.750	52.5
8.416	50.5	8.766	52.6
8.433	50.6	8.783	52.7
8.450	50.7	8.800	52.8
8.466	50.8	8.816	52.9
8.483	50.9	8.833	53.0
8.500	51.0	8.850	53.1
8.516	51.1	8.866	53.2
8.533	51.2	8.883	53.3
8.550	51.3	8.900	53.4
8.566	51.4	8.916	53.5
8.583	51.5	8.933	53.6
8.600	51.6	8.950	53.7
8.616	51.7	8.966	53.8
8.633	51.8	8.983	53.9
8.650	51.9	9.000	54.0
8.666	52.0		

SPURIOUS SIGNALS

Because of the compactness of this unit and the common power supply circuits feeding the various oscillators which will be working simultaneously during alignment and calibration, certain spurious signals are developed which may be heard when tuning the receiver.

These signals should not be troublesome during normal operation of the Transceiver because of the combination of the oscillators and dial settings that it takes to achieve them. In fact, some of the signals can be used to advantage when properly recognized. A good example of this is the BFO and its 2nd and 3rd harmonics, which when turned on and set at 2 mc will give markers at 50 mc, 52 mc, and 54 mc. This gives a good check on overall calibration.

Outlined below are the spurious signals and the oscillator combinations that produce them. NOTE: Depending on lead and component dress, oscillator activity, etc not all of these signals may be heard.

BFO

With the BFO turned ON, the following spurious signals may appear with the receiver dial pointer set as outlined below:

XTAL. OSC.	minus	BFO	equals	TUNABLE IF	RECEIVER DIAL POINTER SET AT
28 mc	-	Fo= 2 mc	=	26 mc	54 mc
28 mc	-	2F= 4 mc	=	24 mc	52 mc
28 mc	-	3F=6 mc	=	22 mc	50 mc

SPOT

With the SPOT switch turned ON, the following spurious signals may appear with the transmitter and receiver dial pointers set as outlined below:

TRANSMITTER DIAL POINTER SET AT	VFO or XTAL HARMONICS	minus	TUNABLE OSC.	equals	LOW FREQ. IF	RECEIVER DIAL POINTER SET AT
54 mc	2F=18 mc	-	20 mc	=	2 mc	50 mc
50 to 52 mc	3F=25 to 26 mc	-	23 to 24 mc	=	2 mc	53 to 54 mc
			XTAL. OSC.		TUNABLE IF	
51 mc	4F=34 mc	-	2F=56 mc	=	22 mc	50 mc
VFO MISALIGNED AT			MULTIPLIED BY			
50 to 54 mc	7.333 to 8.666 mc		3F	=	22 to 26 mc with signal feeding into 2nd mixer (V3-A)	50 to 54 mc

SERVICE INFORMATION

SERVICE

If, after applying the information contained in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under In Case Of Difficulty. Possibly it will not be necessary to write.

2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units and anything else that might help to isolate the cause of trouble.

3. Report fully on the results obtained when testing the unit initially and when following the suggestions under In Case Of Difficulty. Be as specific as possible and include voltage readings if test equipment is available.

4. Identify the kit model number and date of purchase, if available.

5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed instrument to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a minimal service fee, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service for your HEATHKIT equipment. Although you may find charges for local service somewhat higher than for factory service, the amount of increase is usually offset by the transportation charge you would pay if you elected to return your kit to the Heath Company.

HEATHKIT Service Centers will honor the regular 90 day HEATHKIT Parts Warranty on all kits, whether purchased through a dealer or directly from Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Warranty.

THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally improper instrument operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.

B. Identify the type and model number of kit in which it is used.

C. Mention date of purchase.

D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

In the event that your Transceiver must be returned for service, these instructions should be carefully followed.

Make sure the tubes are installed and that the cabinet is secured in place. Also, return the power cables and microphone. Do not send the gimbal mounting bracket.

ATTACH A TAG TO THE EQUIPMENT BEARING YOUR NAME, COMPLETE ADDRESS, DATE OF PURCHASE, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Wrap the equipment in heavy paper, exercising care to prevent damage. Place the wrapped equipment in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the wrapped equipment and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Clearly print the address on the carton as follows:

To: HEATH COMPANY
Benton Harbor, Michigan

Include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit if, in HIS OPINION, the article is inadequately packed for shipment.

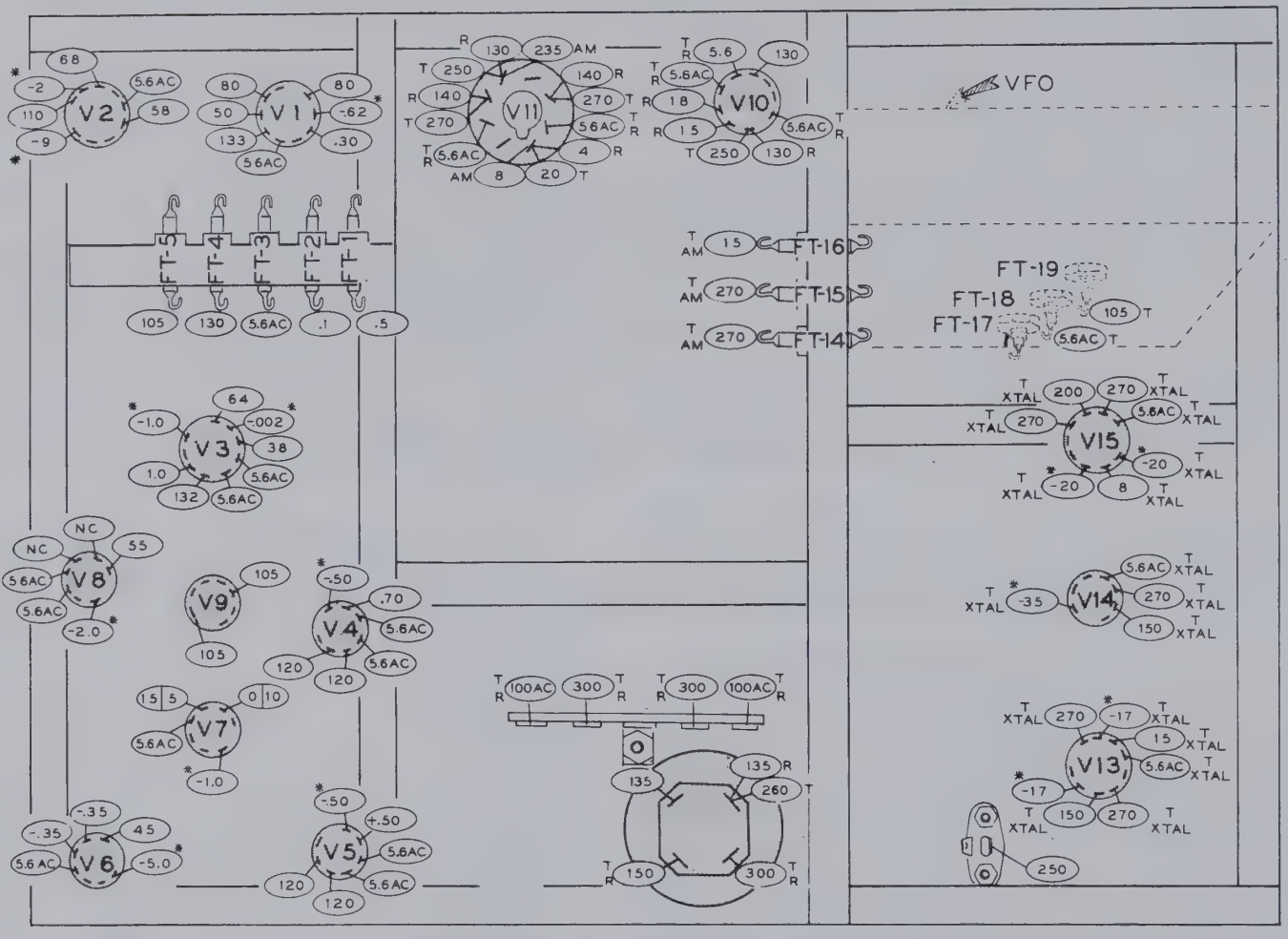
WARRANTY

Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY

VOLTAGE CHART



RECEIVE CONDITIONS R ⬭

CONTROLS SET AS FOLLOWS:

AVC - ON
ANL - OFF
BFO - OFF
RF GAIN - FULL CW
AF GAIN - MINIMUM
FOR V7

FOR V7 ONLY - SQUELCH
CCW | CW
MOD. MONITOR - OFF
ANT. - DUMMY LOAD
SQUELCH - FULL CCW

TRANSMIT CONDITIONS T ⬭

CONTROLS SET AS FOLLOWS:

CW-AM SWITCH T - CW / AM-AM } AS SHOWN

XTAL-VFO SWITCH - VFO-T / XTAL } AS SHOWN

SPOT SWITCH - OFF
REACTANCE CONTROL
LINK COUPLING
FINAL TUNE } ADJ. FOR MAX. OUTPUT
ANT. - DUMMY LOAD (50 Ω)

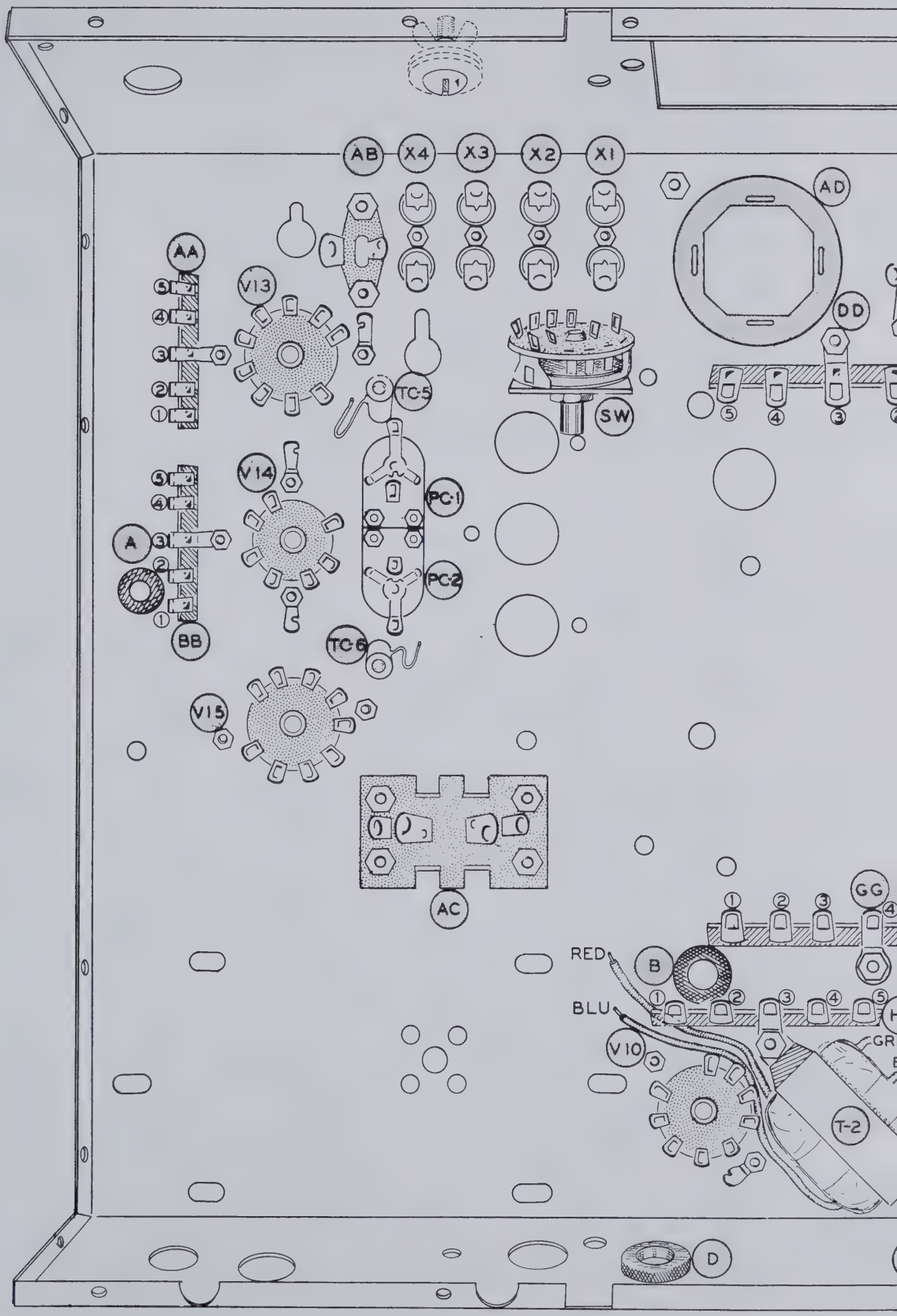
* GRIDS AND TUBE PINS WITH RF PRESENT MAY VARY AS MUCH AS 50%.

ALL MEASUREMENTS MADE UNDER AC INPUT CONDITIONS USING A VACUUM TUBE VOLTMETER (HEATH V7-A).

ALL UNMARKED PINS ARE O V.

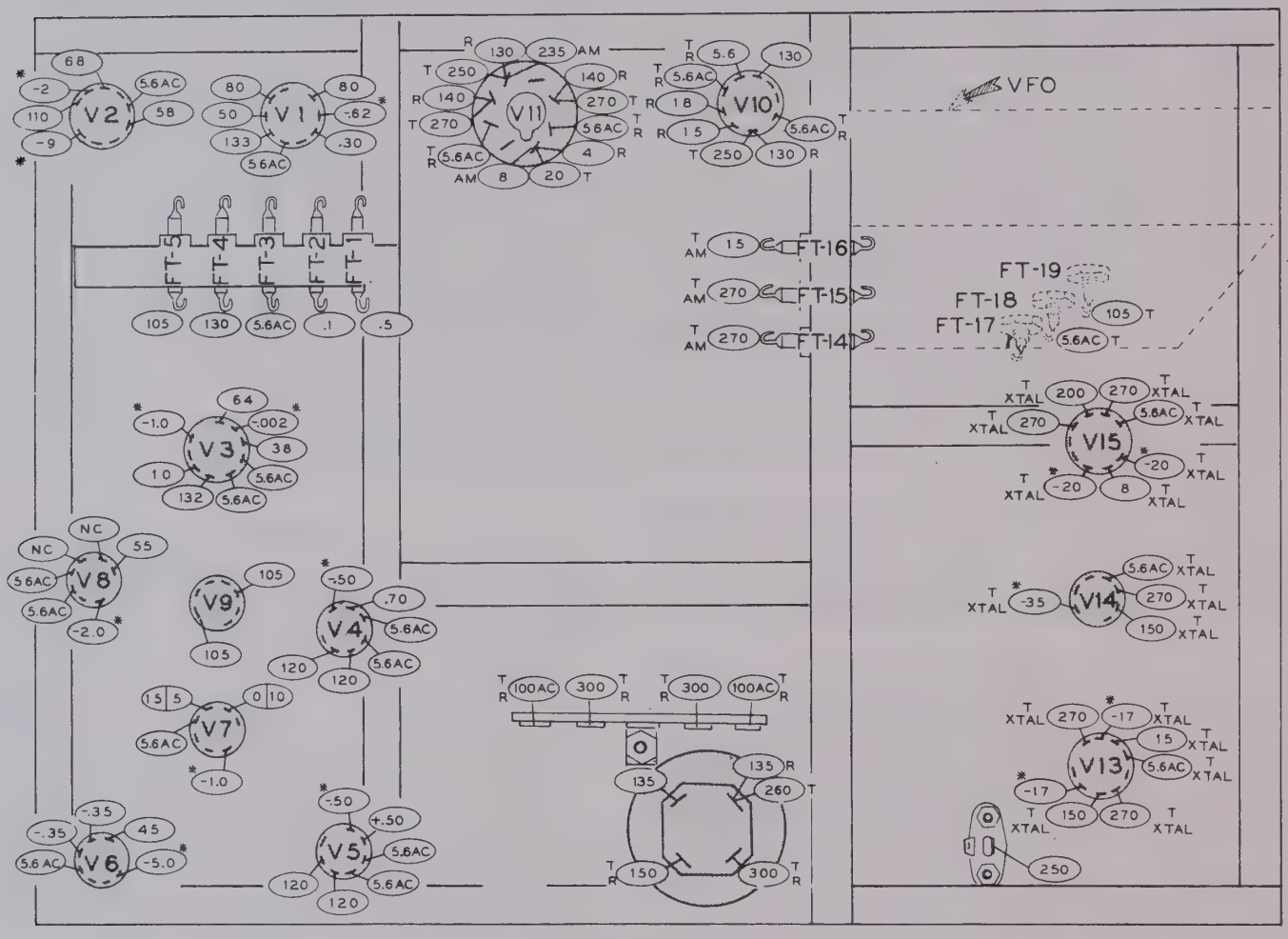
TUBES V13-V15, 1.1 mh RF CHOKE IN SERIES WITH DC PROBE (TYPE OF CHOKE WILL VARY LOAD PRESENTED TO CIRCUIT BEING MEASURED, CONSEQUENTLY, VOLTAGES MAY ALSO VARY TO SOME EXTENT).

ALL VOLTAGES IN DC VOLTS UNLESS OTHERWISE INDICATED.


AB
X4
X3
X2
X1
AD
AA
V13
DD
TC-5
SW
V14
PC-1
A
PC-2
BB
TC-6
V15
AC
GG
RED
B
BLU
V10
T-2
D

Pictorial

VOLTAGE CHART



RECEIVE CONDITIONS R

CONTROLS SET AS FOLLOWS:

AVC - ON
ANL - OFF
BFO - OFF
RF GAIN - FULL CW
AF GAIN - MINIMUM
FOR V7

FOR V7 ONLY - SQUELCH
CCW | CW
MOD. MONITOR - OFF
ANT. - DUMMY LOAD
SQUELCH - FULL CCW

TRANSMIT CONDITIONS T

CONTROLS SET AS FOLLOWS:

CW-AM SWITCH T - CW, AM-AM } AS SHOWN

XTAL-VFO SWITCH - VFO-T, XTAL } AS SHOWN

SPOT SWITCH - OFF
REACTANCE CONTROL
LINK COUPLING
FINAL TUNE } ADJ. FOR MAX. OUTPUT
ANT. - DUMMY LOAD (50 Ω)

* GRIDS AND TUBE PINS WITH RF PRESENT MAY VARY AS MUCH AS 50%.

ALL MEASUREMENTS MADE UNDER AC INPUT CONDITIONS USING A VACUUM TUBE VOLTMETER (HEATH V7-A).

ALL UNMARKED PINS ARE 0 V.

TUBES V13-V15. 1.1 mh RF CHOKE IN SERIES WITH DC PROBE (TYPE OF CHOKE WILL VARY LOAD PRESENTED TO CIRCUIT BEING MEASURED, CONSEQUENTLY, VOLTAGES MAY ALSO VARY TO SOME EXTENT).

ALL VOLTAGES IN DC VOLTS UNLESS OTHERWISE INDICATED.

PARTS PICTORIAL

5 WATT RESISTOR

2 WATT RESISTOR

1 WATT RESISTOR

½ WATT RESISTOR

*45-4 1.1MH RF CHOKE

*45-36 7µh RF CHOKE

*45-31 11µh RF CHOKE

*45-33 305 UH RF CHOKE

*45-39 .45µh RF CHOKE

*45-20 "A" CHOKE

*252-7 3/8"-32 CONTROL NUT

*252-30 10-24 NUT

*252-19 6-32 PALNUT

*252-3 6-32 NUT

*252-1 *3-48 NUT

*252-15 4-40 NUT

*252-28 8-32 THUMBNUT

*254-4 CONTROL LOCKWASHER (THICK)

*254-15 #16 LOCKWASHER

*254-5 CONTROL LOCKWASHER (THIN)

*254-3 #10 LOCKWASHER

*254-6 #6 LOCKWASHER

*254-9 #4 LOCKWASHER

*254-7 #3 LOCKWASHER

*253-6 #10 x 1/16" THICK FIBER WASHER

*253-10 CONTROL FLAT WASHER

*253-34 #6 x 3/32" THICK FIBER WASHER

*253-5 #8 x 1/16" THICK FIBER WASHER

*253-36 DISHED SPRING WASHER

*253-11 "E" WASHER

*258-1 DIAL CORD SPRING

*431-14 2-LUG TERMINAL STRIP

*431-2 2-LUG TERMINAL STRIP

*431-38 3-LUG TERMINAL STRIP MINIATURE

*431-11 5-LUG TERMINAL STRIP

*431-39 5-LUG (MINIATURE) TERMINAL STRIP

*431-3 3-LUG TERMINAL STRIP

*431-42 5-LUG WIDE SPACED TERMINAL STRIP

*431-45 6-LUG TERMINAL STRIP

*431-16 2-LUG TERMINAL STRIP

*453-56 DIAL CORD DRIVE SHAFT

*453-100 ¼" x 1-1/32" LONG WITH 9/32" STRING DIA.

*453-94 3-1/16" LONG PHENOLIC SHAFT

*453-97 SLOTTED DIAL CORD DRIVE SHAFT

*453-99 3-5/8" DIAL PULLEY SHAFT

*453-95 4-9/16" LINK COUPLING SUPPORT SHAFT

*453-98 5-½" BRASS TUBULAR DRIVE SHAFT

*453-96 3/16" x 8" SWITCH EXTENSION SHAFT

#205-M276

#214-M11

#206-M134

#214-M10

#204-M348

#204-M341

#100-M302

#205-M245

#205-M244

#100-M285

#204-M340

#214-M9

#204-M344

#205-M255

#200-M281

#205-M248

#205-M246

#205-M249

#205-M247

#205-M250

#200-M273F388

#205-M251

#205-M252

*250-22 8-32 x 7/16" SLOTTED HEAD SETSCREW

*250-35 *8 x 7/8" SHEET METAL SCREW

*250-93 8-32 x ¼" ALLEN HEAD SETSCREW

*250-83 #10 ACORN HEAD SHEET METAL SCREW

*250-105 8-32 x 1/8" ALLEN HEAD SETSCREW

*250-8 #6 SHEET METAL SCREW

*250-33 6-32 x 1/8" SLOTTED HEAD SETSCREW

*250-34 4-40 x ½" RHMS

*250-79 6-32 x 1¼" RHMS

*250-25 4-40 x 1/8" FHMS

*250-134 6-32 x ¾" RHMS (BRASS)

*250-49 3-48 x ¼" BHMS

*250-26 6-32 x 5/8" BHMS

*250-63 3-48 x 1/8" RHMS

*250-56 6-32 x ¼" BHMS

*250-84 8-32 SPECIAL STUD SCREW

*251-1 6-32 SPADE BOLT

*73-2 3/4" RUBBER GROMMET

*73-3 ½" RUBBER GROMMET

*73-1 ⅜" GROMMET

*73-4 5/16" GROMMET

*250-152 10-24 x ¾" RHMS

*250-50 10-32 x ⅜" PHMS

#250-126 10-32 x ½" THMS

*252-31 10-24 WING NUT

#259-10 CONTROL SOLDER LUG

*252-49 SHOULDERED THUMBNUT

*259-1 #6 LARGE SOLDER LUG

*259-6 #6 SMALL SOLDER LUG

*259-16 #8 SPADE SOLDER LUG

*259-11 #6 SPADE SOLDER LUG

*255-44 10-32 SPACER (SHOULDERED)

*255-45 TAPPED PHENOLIC SPACER

*255-13 6 x 1/4" SPACER

*260-7 IF TRANSFORMER MOUNTING CLIP

*260-31 FAHNESTOCK CLIP

*260-32 POWER PLUG LOCK CLIP

*266-18 ROTATIONAL STOP

*455-6 ¼" ROUND FLANGE BUSHING

*455-15 RETAINER BUSHING

*455-28 3/16" I.D. x 3/8" HEX FLANGE BUSHING

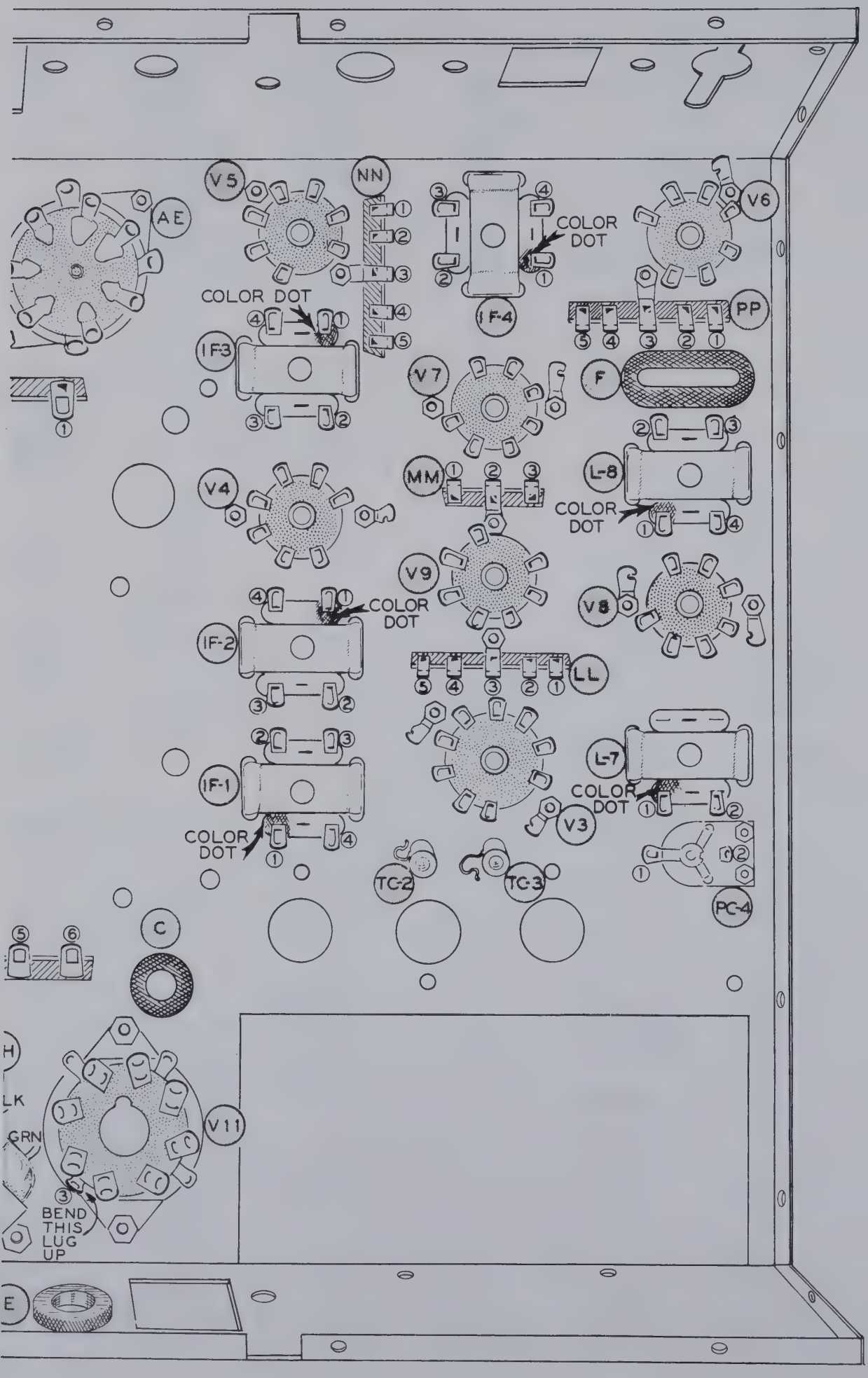
*205-M87 TUBE PIN SHIELD PLATE

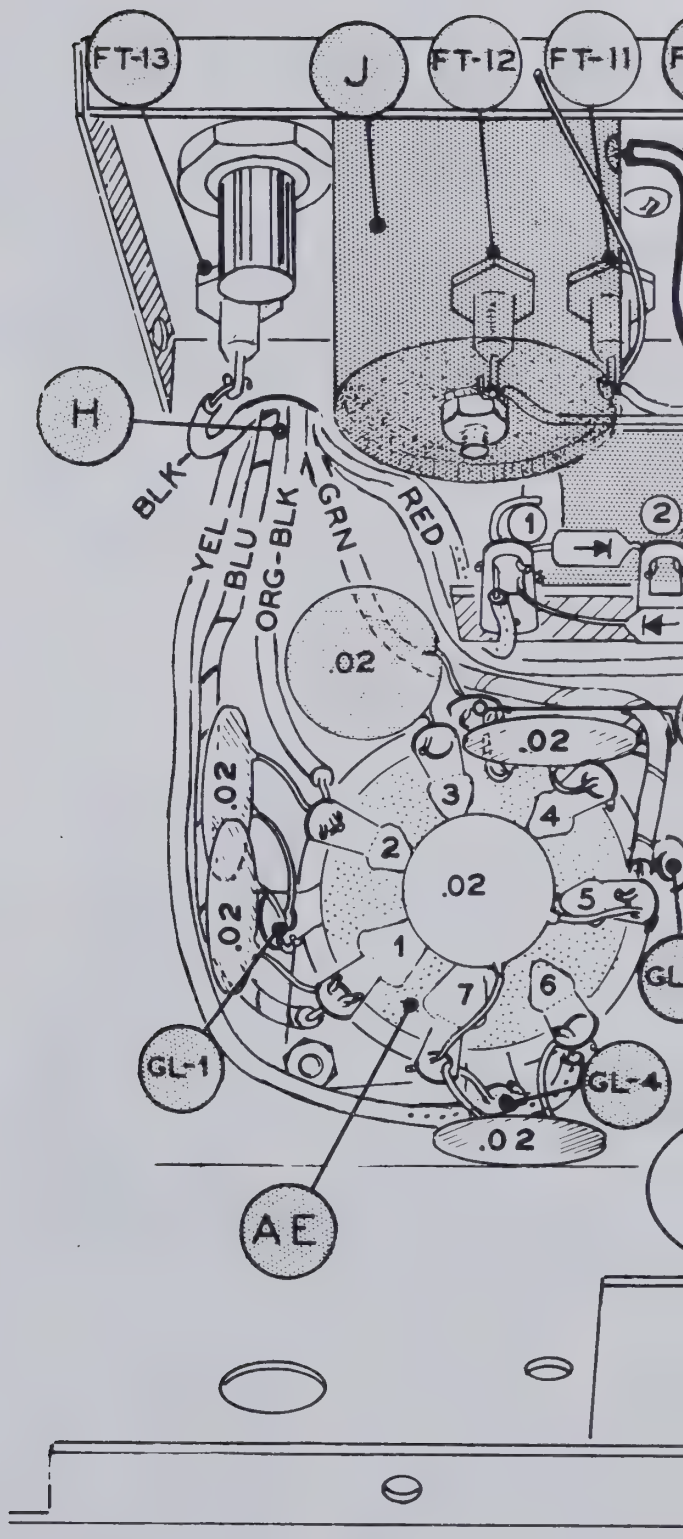
*455-10 17/64" I.D. x 3/8" HEX FLANGE BUSHING

*455-11 SPLIT BUSHING

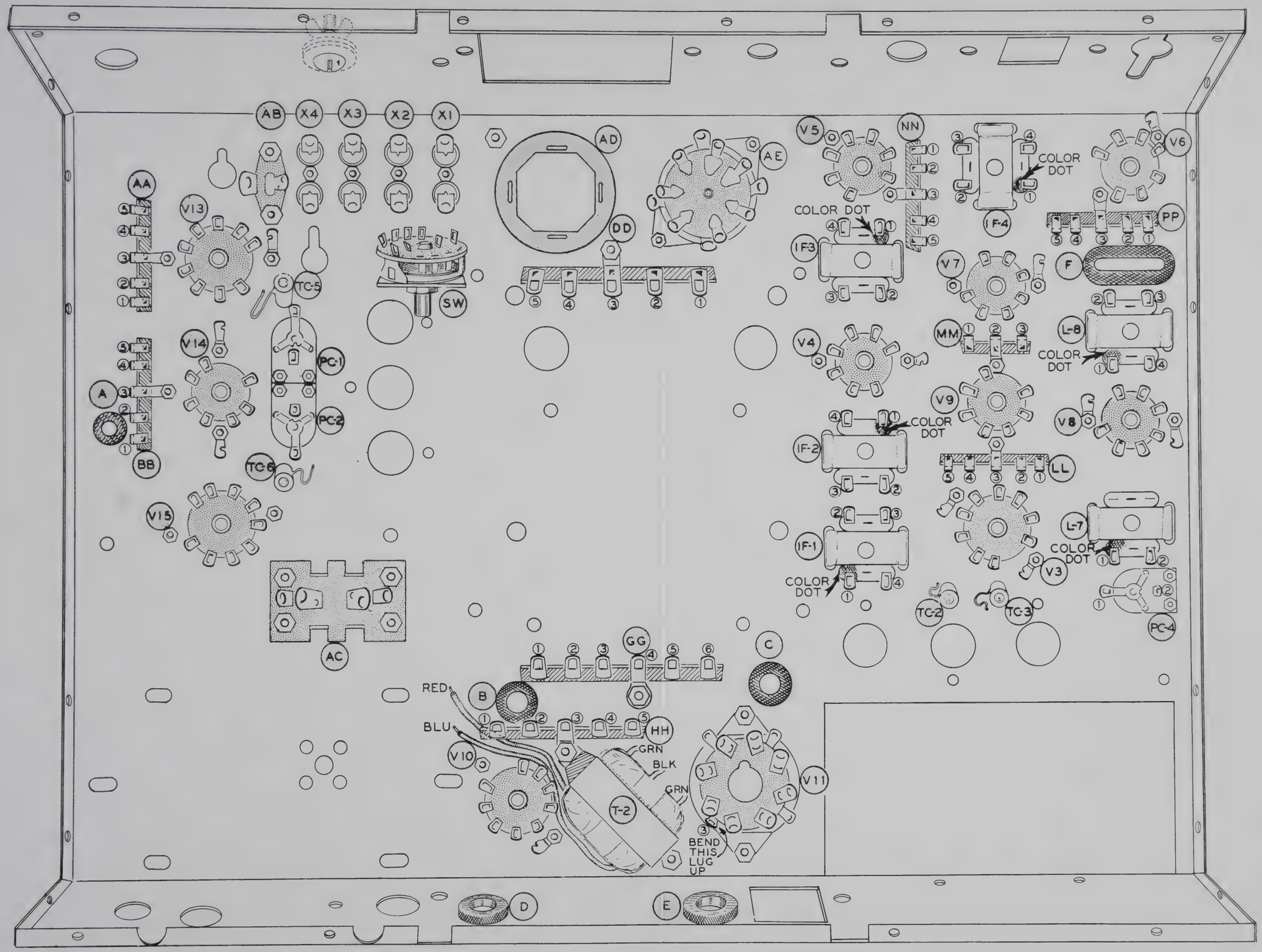
*455-26 1/4" I.D. x 1/2" HEX FLANGE BUSHING

#206-43 COAXIAL JACK SHIELD

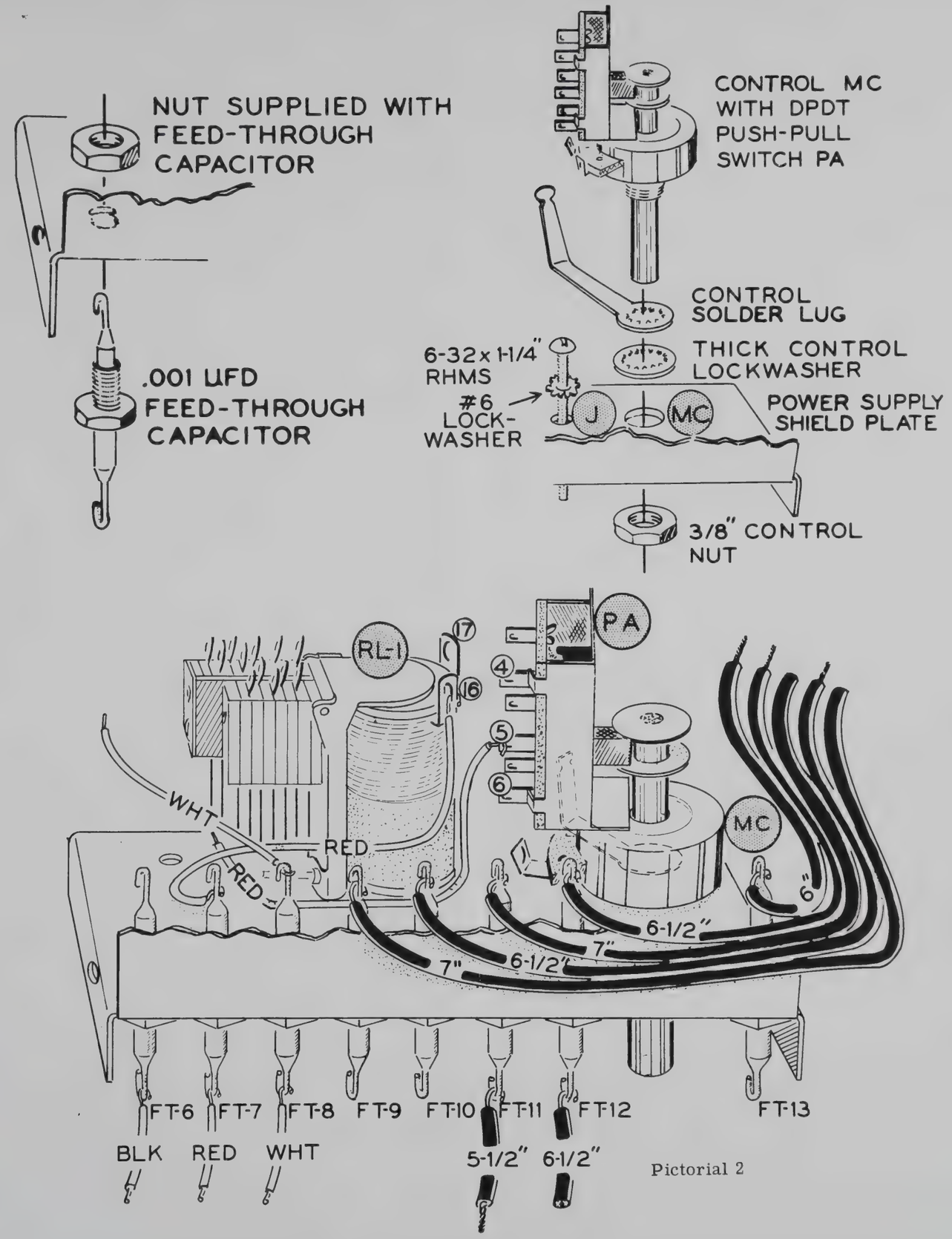

AE
V5
NN
COLOR DOT
IF-3
IF-4
COLOR DOT
V6
PP
V7
F
MM
L-8
COLOR DOT
V4
V9
V8
IF-2
COLOR DOT
LL
L-7
COLOR DOT
IF-1
COLOR DOT
V3
TC-2
TC-3
PC-4
C
V11
BEND THIS LUG UP
GRN


FT-13
J
FT-12
FT-11
H
BLK
YEL
BLU
ORG-BLK
GRN
RED
1
2
.02
.02
.02
.02
.02
3
4
2
5
1
7
6
GL-1
GL-4
AE

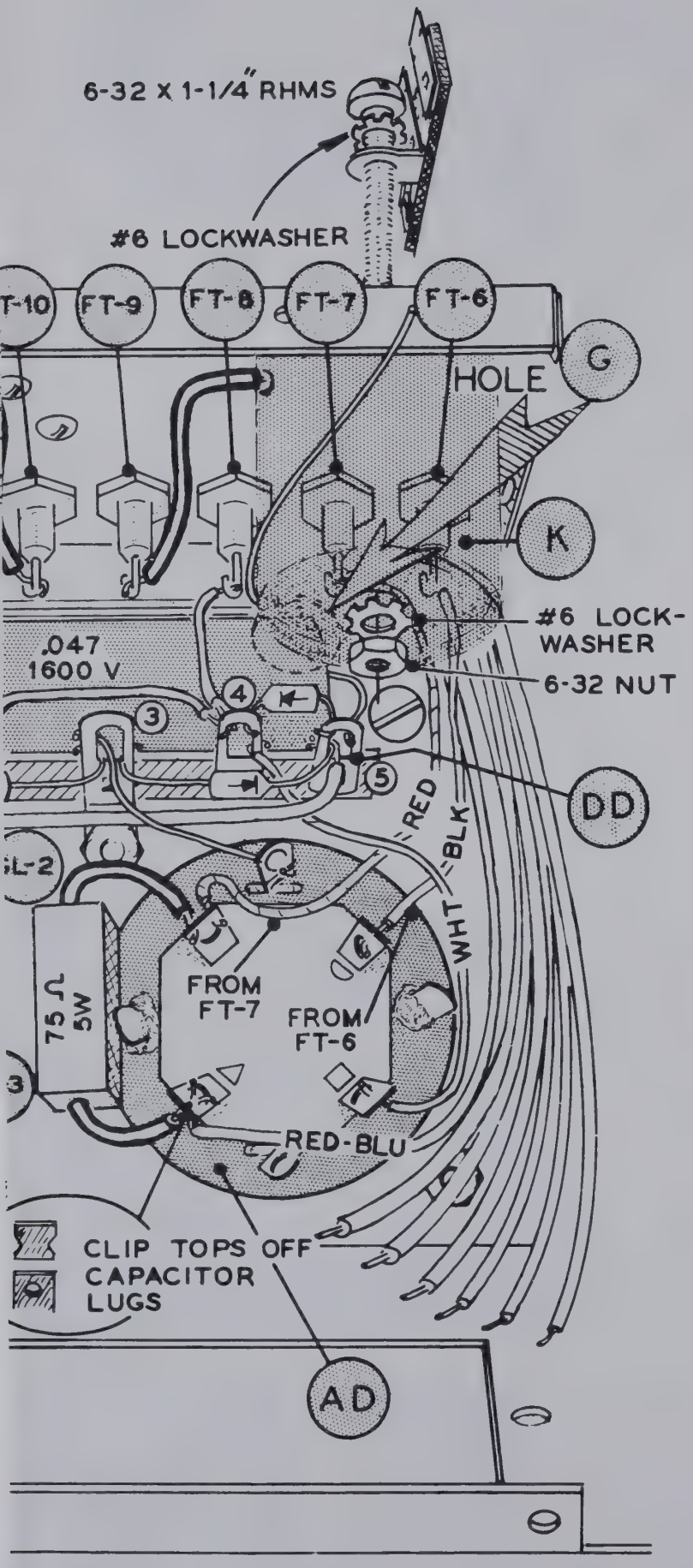
Pic


AB
X4
X3
X2
X1
AD
AE
DD
AA
V13
TC-5
SW
V14
PC-1
PC-2
A
BB
TC-6
V15
AC
V5
NN
COLOR DOT
IF-3
IF-4
V6
PP
F
V7
L-8
MM
V4
V9
V8
IF-2
LL
IF-1
L-7
V3
TC-2
TC-3
PC-4
GG
C
RED
B
BLU
HH
GRN
BLK
GRN
V10
T-2
V11
BEND THIS LUG UP
D
E

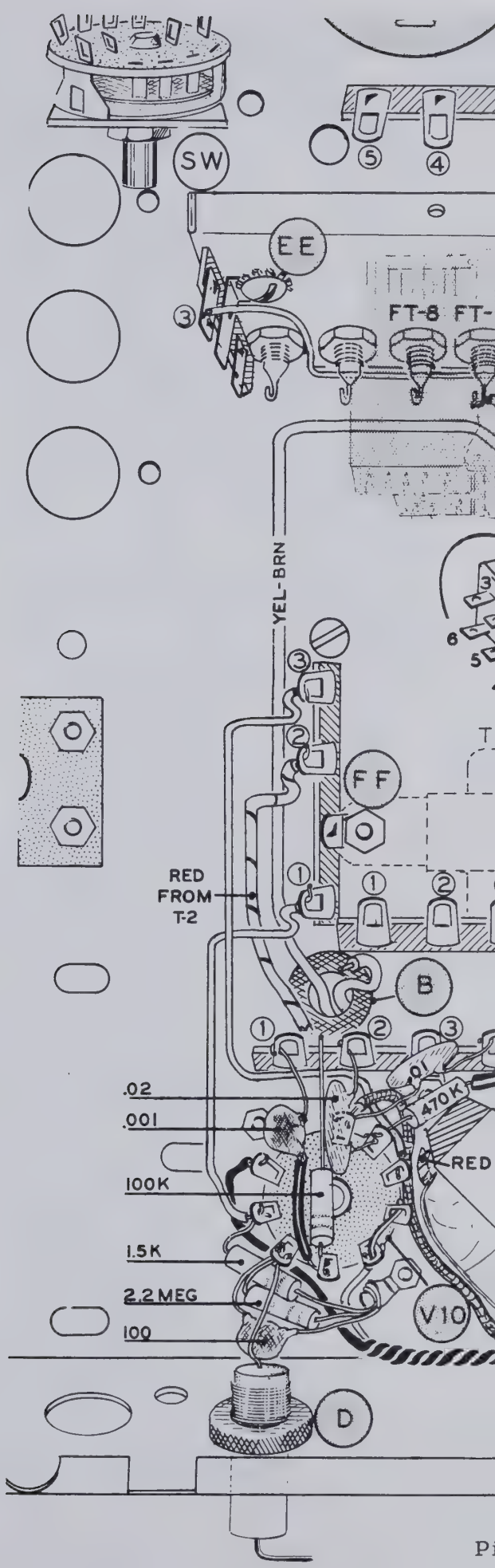
Pictorial 1

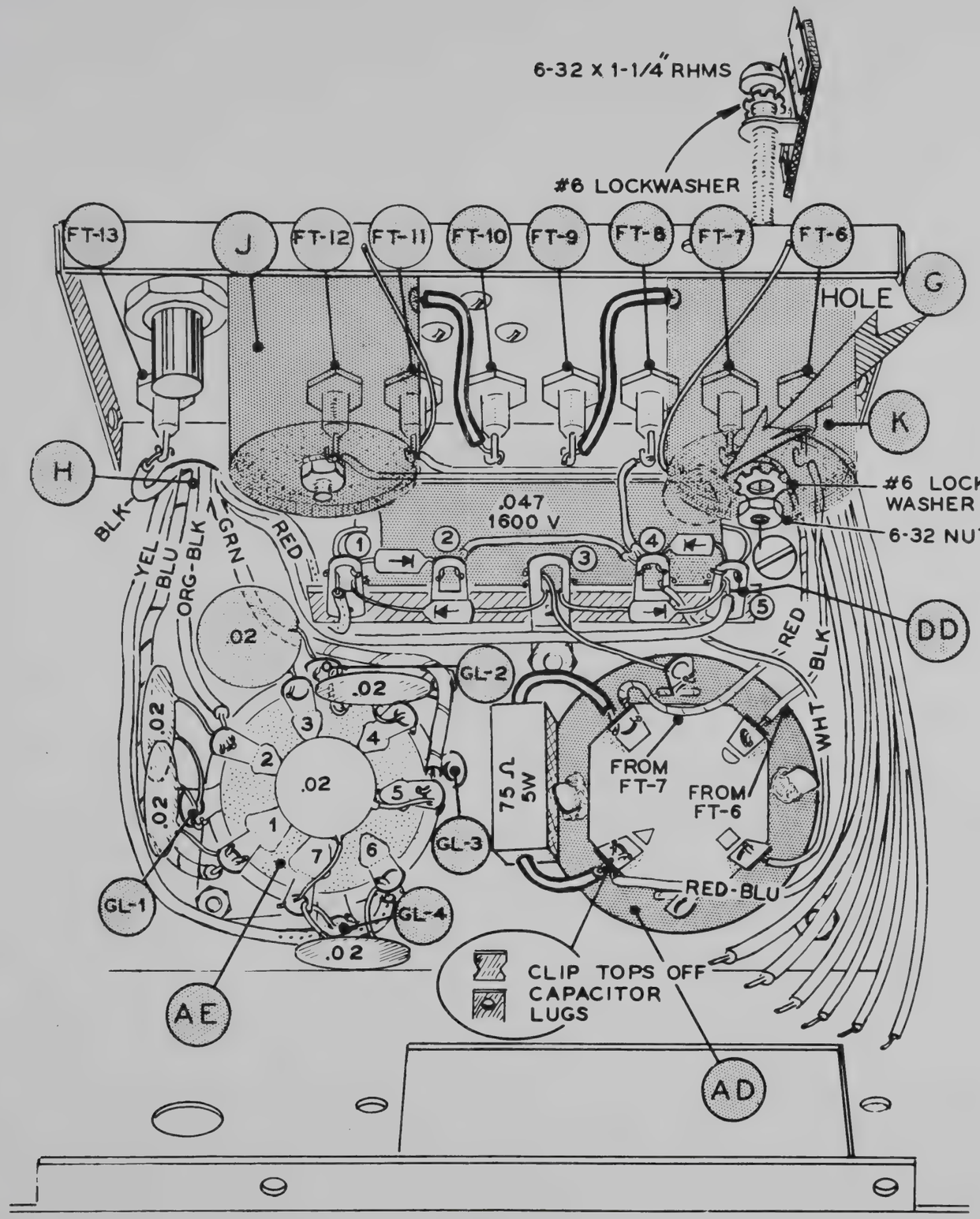

NUT SUPPLIED WITH FEED-THROUGH CAPACITOR
.001 UFD FEED-THROUGH CAPACITOR
CONTROL MC WITH DPDT PUSH-PULL SWITCH PA
CONTROL SOLDER LUG
THICK CONTROL LOCKWASHER
6-32 x 1-1/4" RHMS
#6 LOCK-WASHER
POWER SUPPLY SHIELD PLATE
3/8" CONTROL NUT
RL-1
PA
MC
WHT
RED
RED
6-1/2"
7"
6-1/2"
7"
6"
FT-6
FT-7
FT-8
FT-9
FT-10
FT-11
FT-12
FT-13
BLK
RED
WHT
5-1/2"
6-1/2"

Pictorial 2

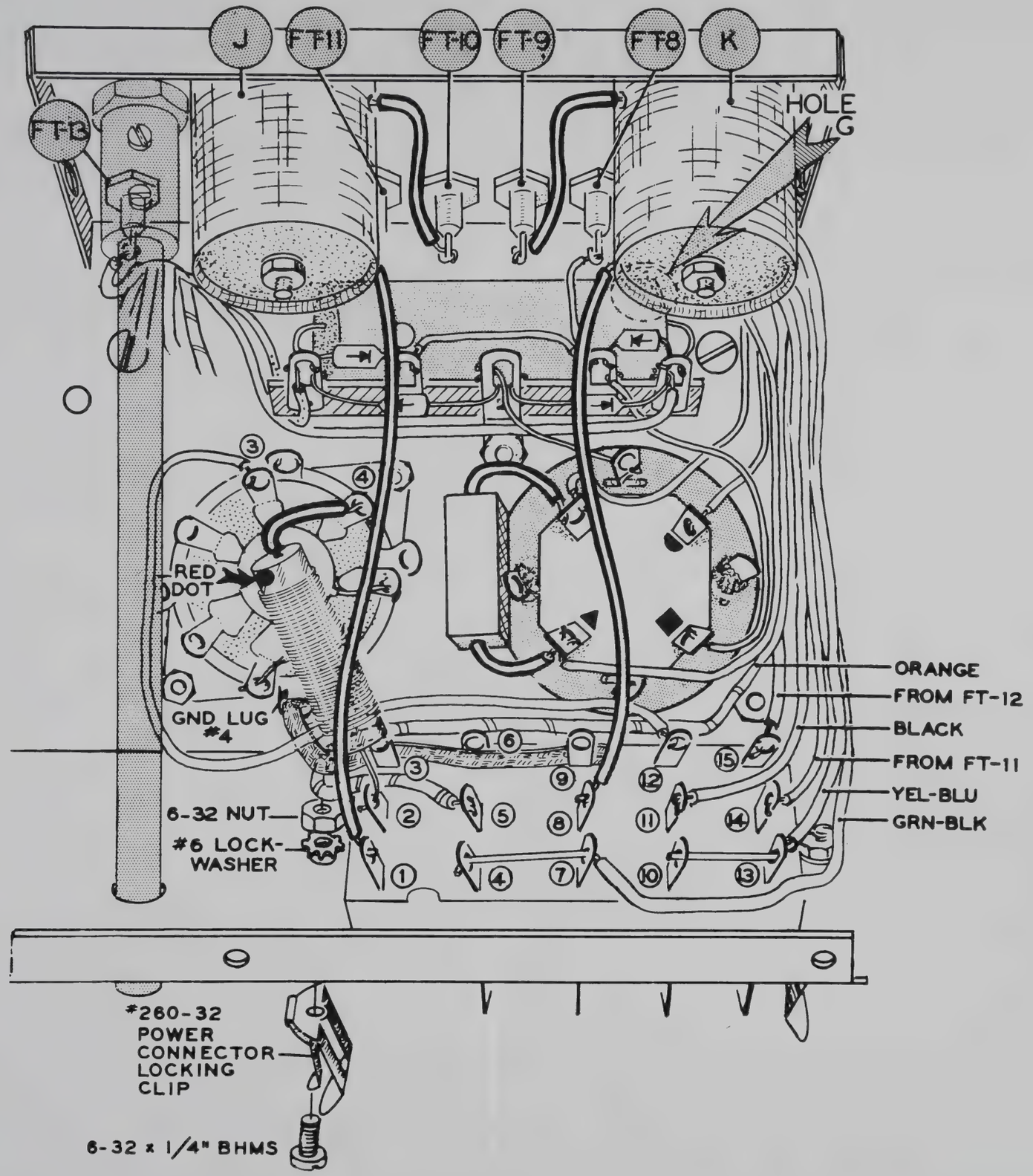

6-32 X 1-1/4" RHMS
#6 LOCKWASHER
T-10
FT-9
FT-8
FT-7
FT-6
HOLE
G
K
#6 LOCK-
WASHER
6-32 NUT
.047
1600 V
4
3
5
DD
RED
BLK
WHT
iL-2
75 Ω
5W
FROM
FT-7
FROM
FT-6
RED-BLU
CLIP TOPS OFF
CAPACITOR
LUGS
AD

orial 6

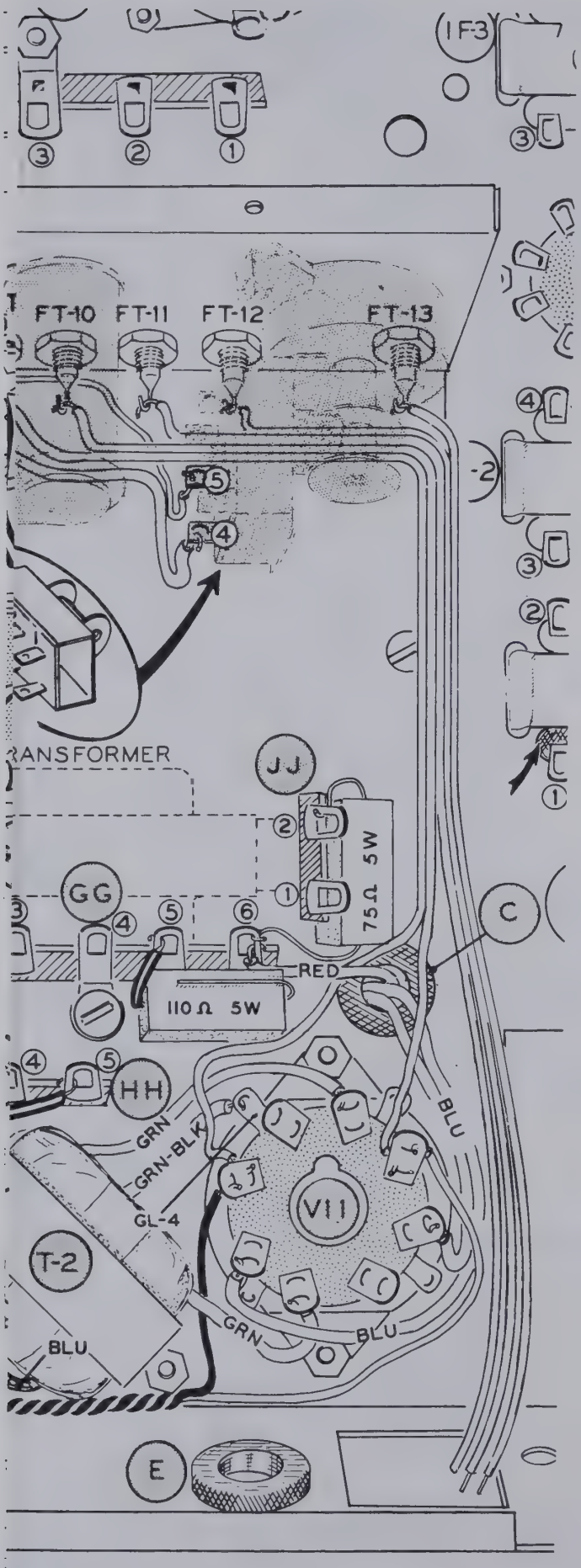

SW
EE
FT-8
YEL-BRN
FF
RED
FROM
T-2
B
.02
.001
100K
1.5K
2.2 MEG
100
470K
V10
D


6-32 X 1-1/4" RHMS
#6 LOCKWASHER
FT-13
J
FT-12
FT-11
FT-10
FT-9
FT-8
FT-7
FT-6
HOLE
G
K
H
#6 LOCK-WASHER
6-32 NUT
.047
1600 V
BLK
YEL
BLU
ORG-BLK
GRN
RED
DD
.02
GL-2
.02
.02
.02
.02
.02
75 Ω 5W
FROM FT-7
FROM FT-6
WHT
BLK
RED
RED-BLU
GL-1
GL-3
GL-4
CLIP TOPS OFF CAPACITOR LUGS
AE
AD

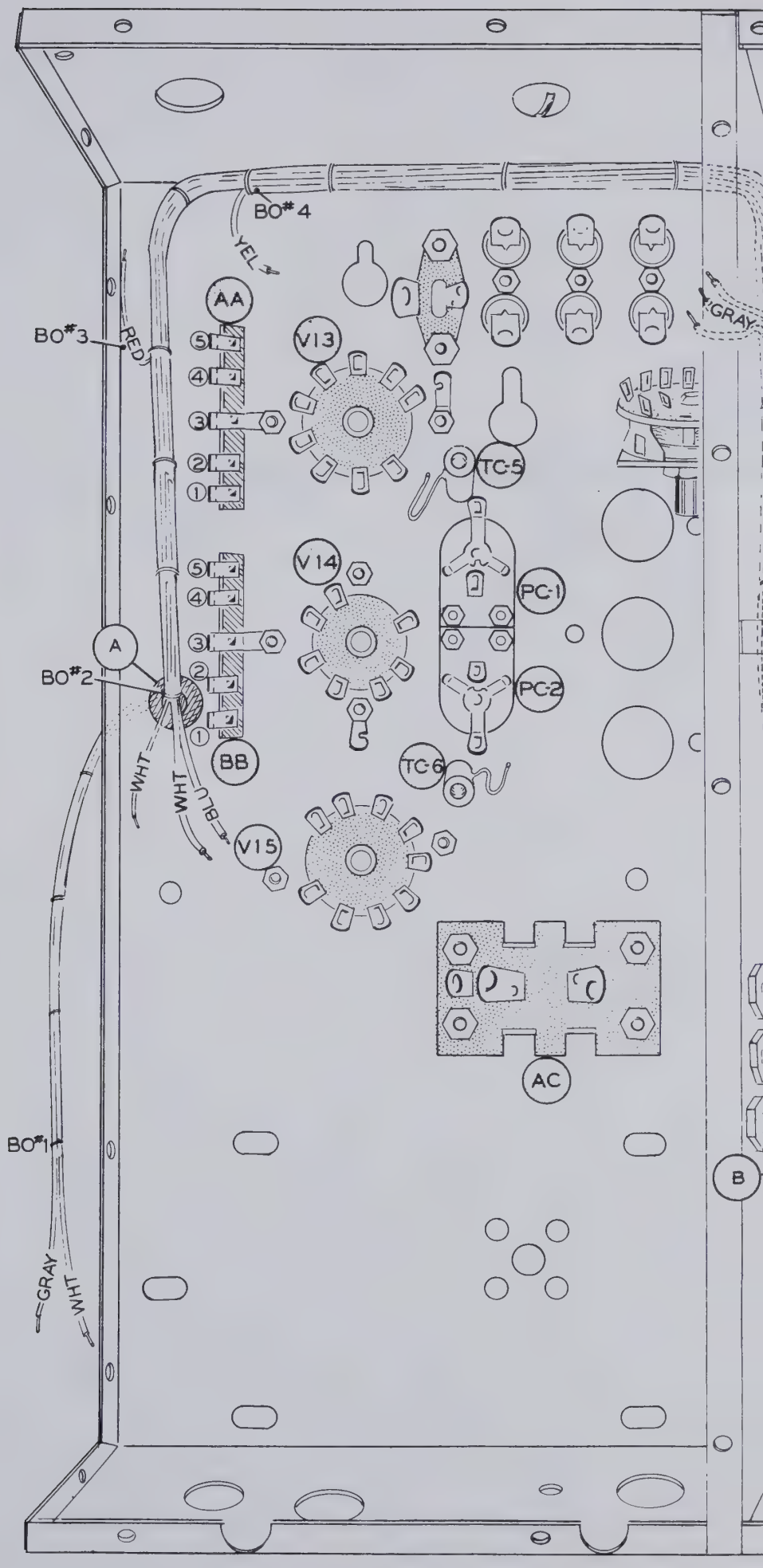
Pictorial 6


J
FT11
FT-10
FT-9
FT8
K
FT-12
HOLE G
RED DOT
GND LUG #4
6-32 NUT
#6 LOCK-WASHER
#260-32 POWER CONNECTOR LOCKING CLIP
6-32 x 1/4" BHMS
ORANGE
FROM FT-12
BLACK
FROM FT-11
YEL-BLU
GRN-BLK

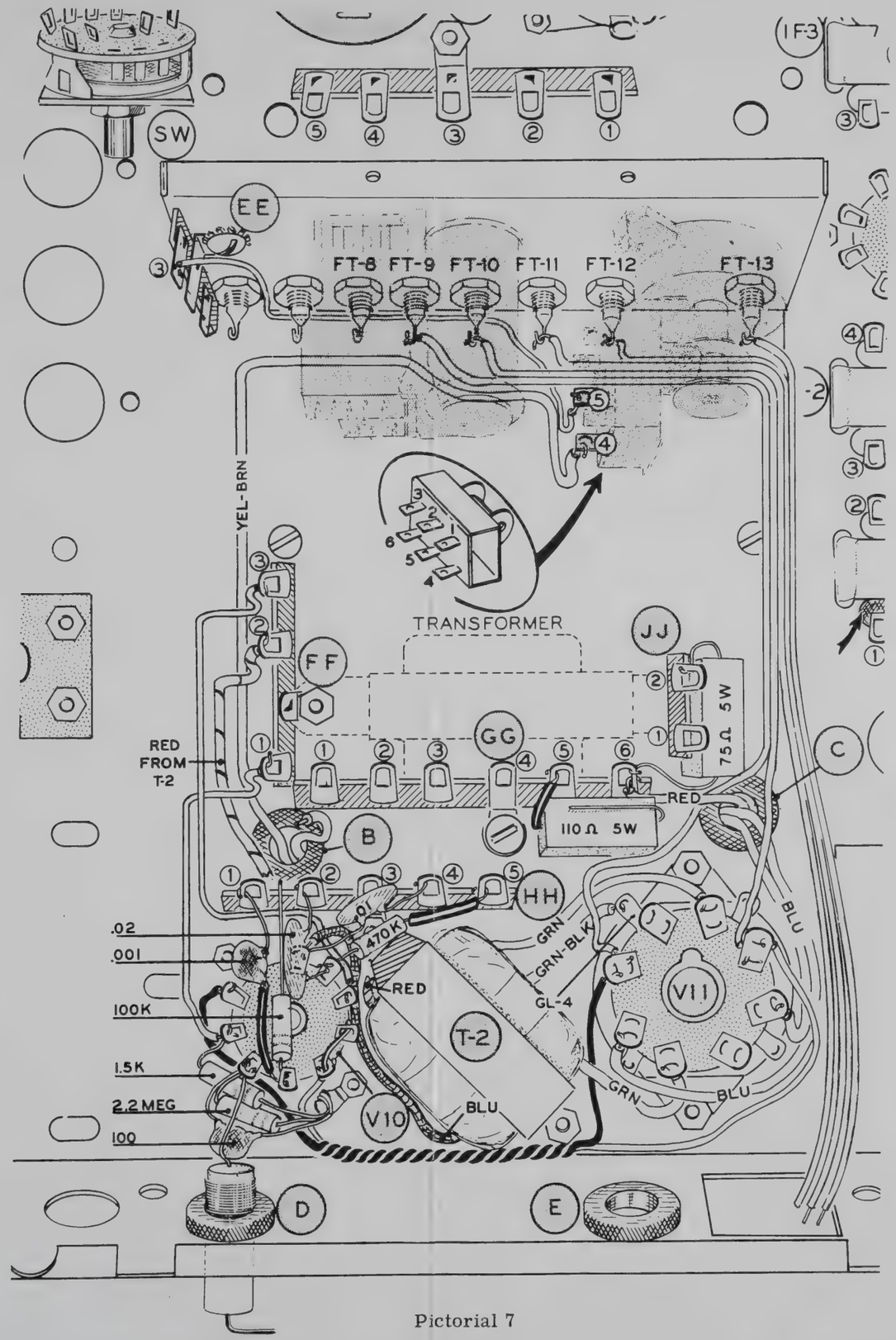
Detail 6C


IF-3
FT-10
FT-11
FT-12
FT-13
TRANSFORMER
JJ
75Ω 5W
GG
110Ω 5W
RED
HH
GRN
GRN-BLK
GL-4
V11
T-2
BLU
GRN
BLU
BLU
C
E

ctorial 7


BO#4
YEL
AA
BO#3
RED
V13
GRAY
TC-5
V14
PC-1
A
BO#2
PC-2
BB
TC-6
WHT
WHT
BLU
V15
AC
B
BO#1
GRAY
WHT

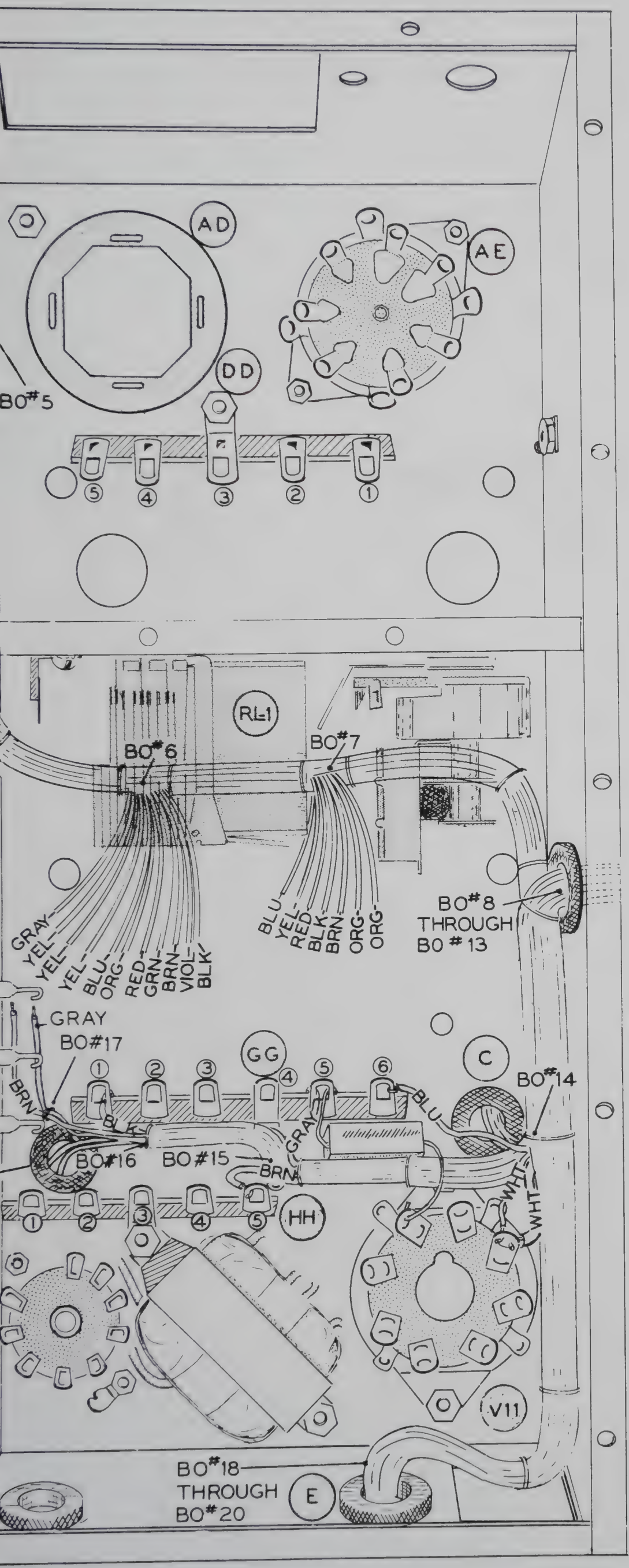
Pictor

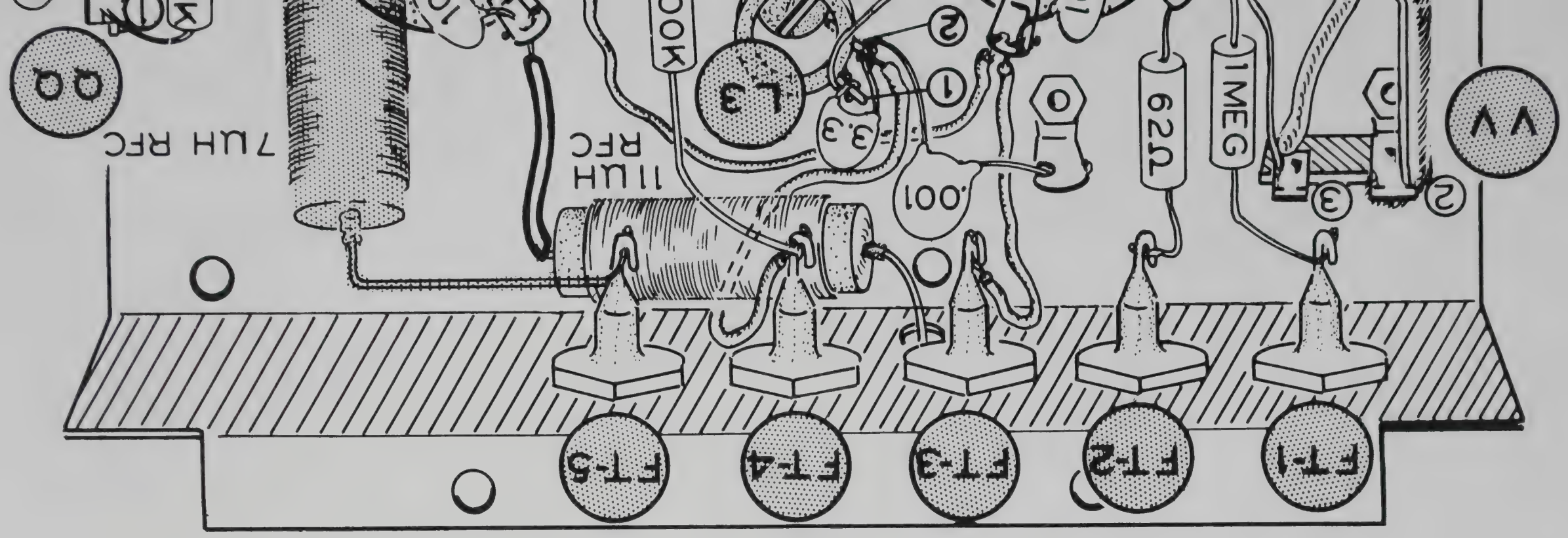

SW
EE
FT-8
FT-9
FT-10
FT-11
FT-12
FT-13
1F-3
YEL-BRN
TRANSFORMER
FF
GG
JJ
75Ω 5W
RED
FROM
T-2
B
HH
110Ω 5W
RED
.02
.001
100K
1.5K
2.2 MEG
100
470K
RED
T-2
V10
BLU
GRN
GRN-BLK
GL-4
V11
GRN
BLU
BLU
C
D
E

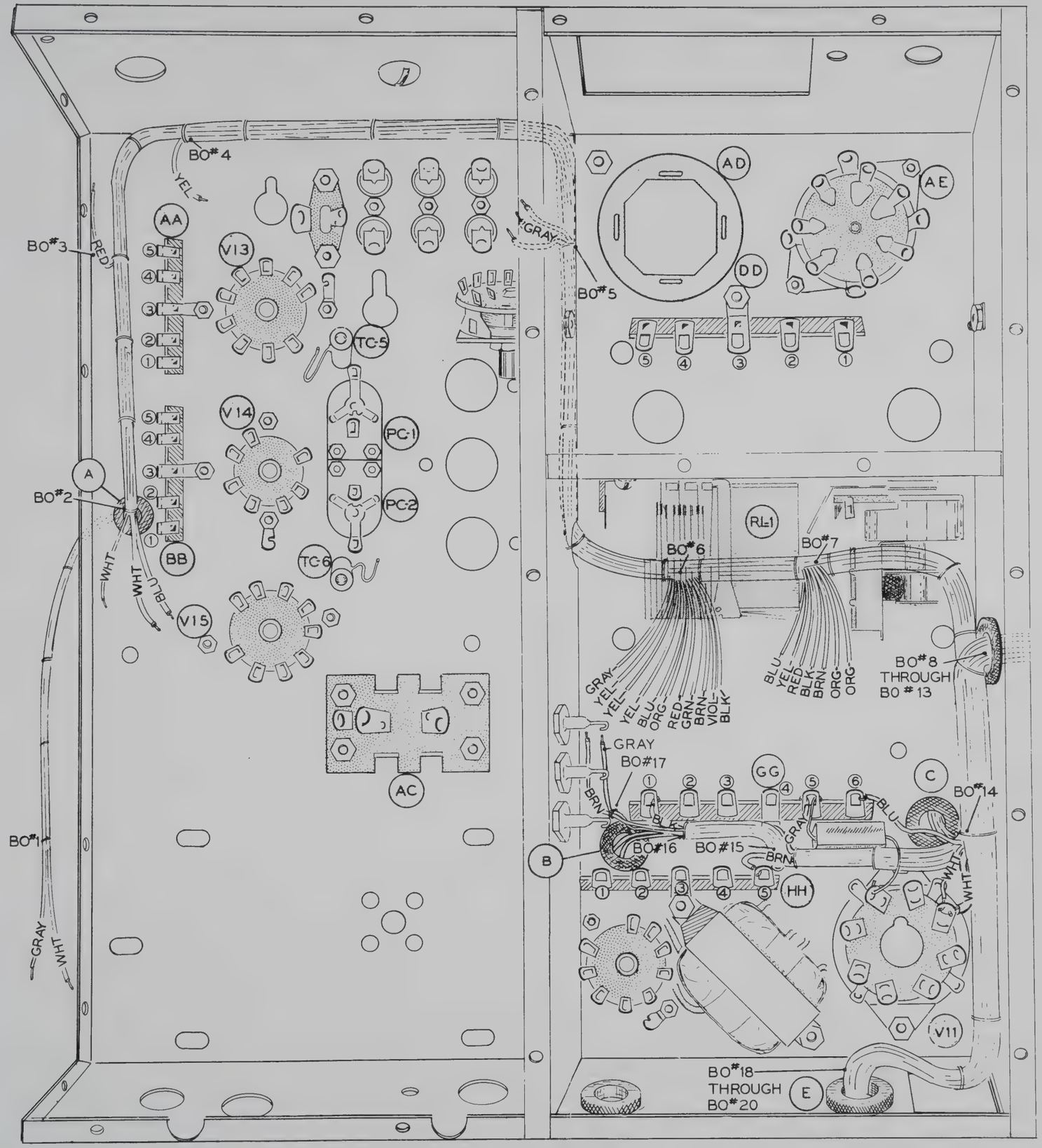
Pictorial 7

BO#13
BO#12
BO#11
BO#10
BO#9
BO#8
BO#1
BO#2
BO#3
BO#4
BO#5
BO#6
BO#7
BO#14
BO#18
BO#20
BO#15
BO#16
BO#19
BO#17

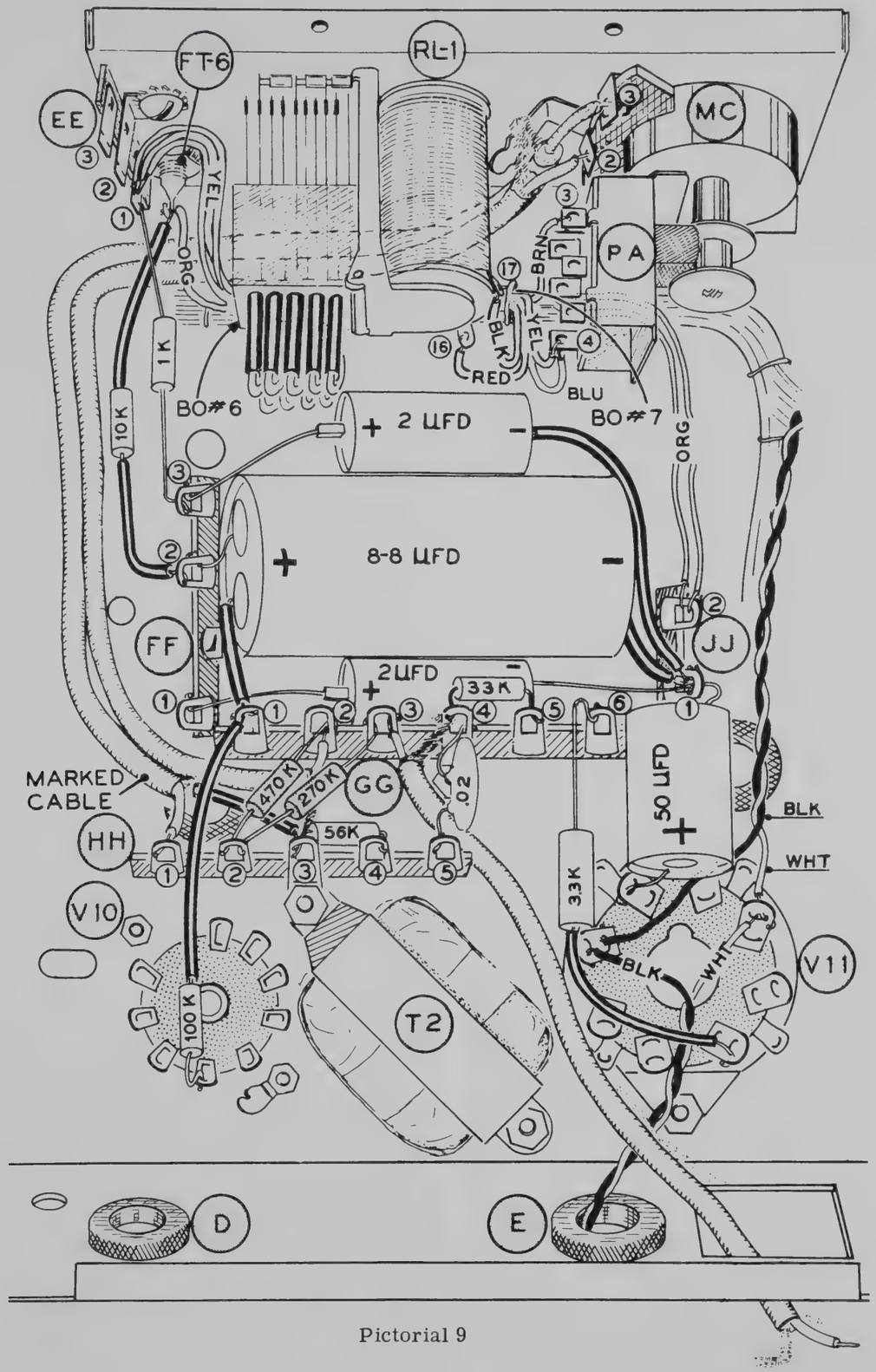
Detail 7B


AD
AE
DD
BO#5
5
4
3
2
1
RL-1
BO#6
BO#7
BO#8
THROUGH
BO#13
GRAY
YEL
YEL
YEL
BLU
ORG
RED
GRN
BRN
VIOL
BLK
BLU
YEL
RED
BLK
BRN
ORG
ORG
GRAY
BO#17
GG
C
BO#14
BRN
BLK
BO#16
BO#15
BRN
GRAY
BLU
WHT
WHT
HH
V11
BO#18
THROUGH
BO#20
E

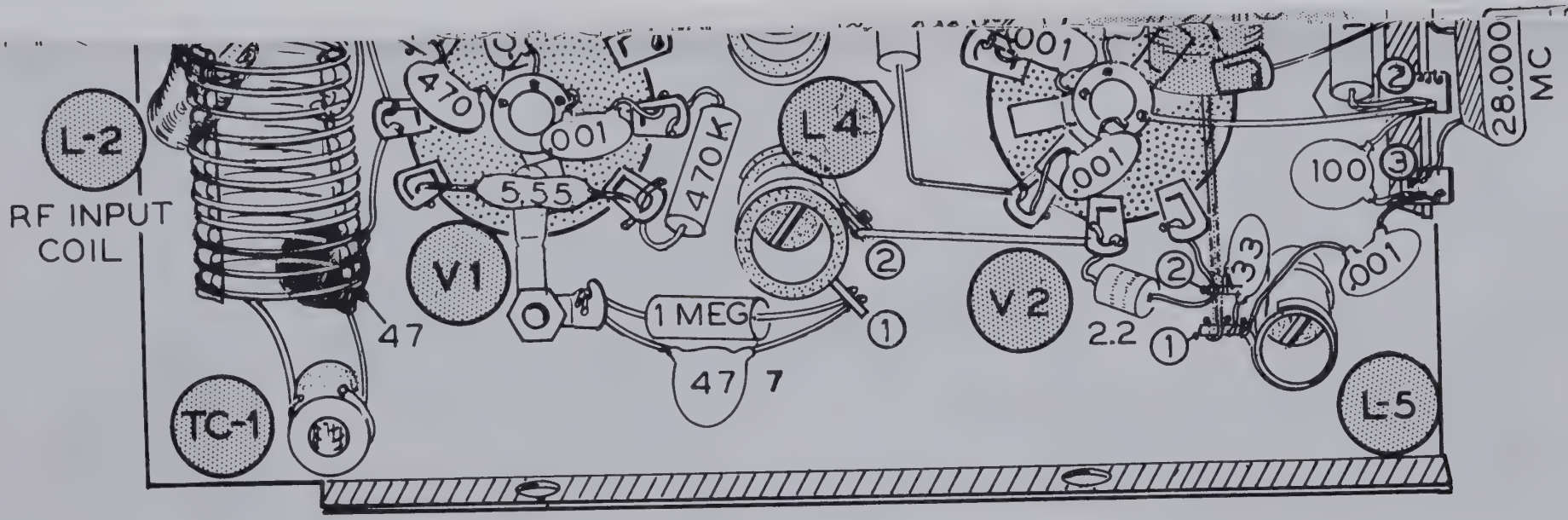

FT-5
FT-4
FT-3
FT-2
FT-1
7UH RFC
11UH RFC
L3
.001
3.3
1
62Ω
1MEG
100K
2
1
3


BO#4
YEL
AA
BO#3
RED
V13
TC-5
V14
PC-1
PC-2
A
BO#2
BB
TC-6
WHT
WHT
BLU
V15
AC
BO#1
GRAY
WHT
GRAY
BO#5
AD
AE
DD
RL-1
BO#6
BO#7
BO#8
THROUGH
BO#13
GRAY
YEL
YEL
YEL
BLU
ORG
RED
GRN
BRN
VIOL
BLK
BLU
YEL
RED
BLK
BRN
ORG
ORG
GRAY
BO#17
GG
C
BO#14
BRN
BLU
BO#16
BO#15
GRAY
BLU
BRN
WHT
WHT
B
HH
V11
BO#18
THROUGH
BO#20
E

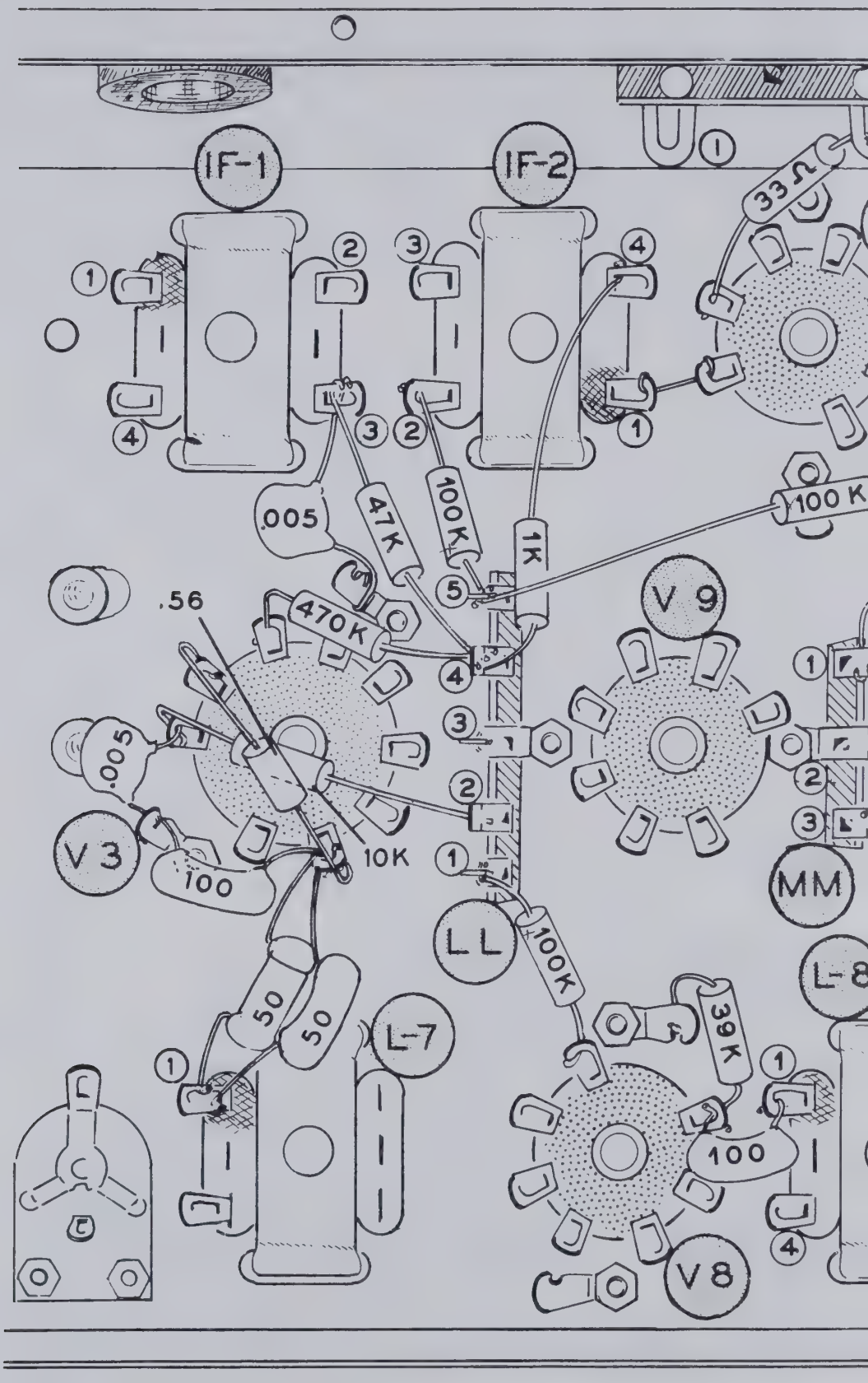
Pictorial 8

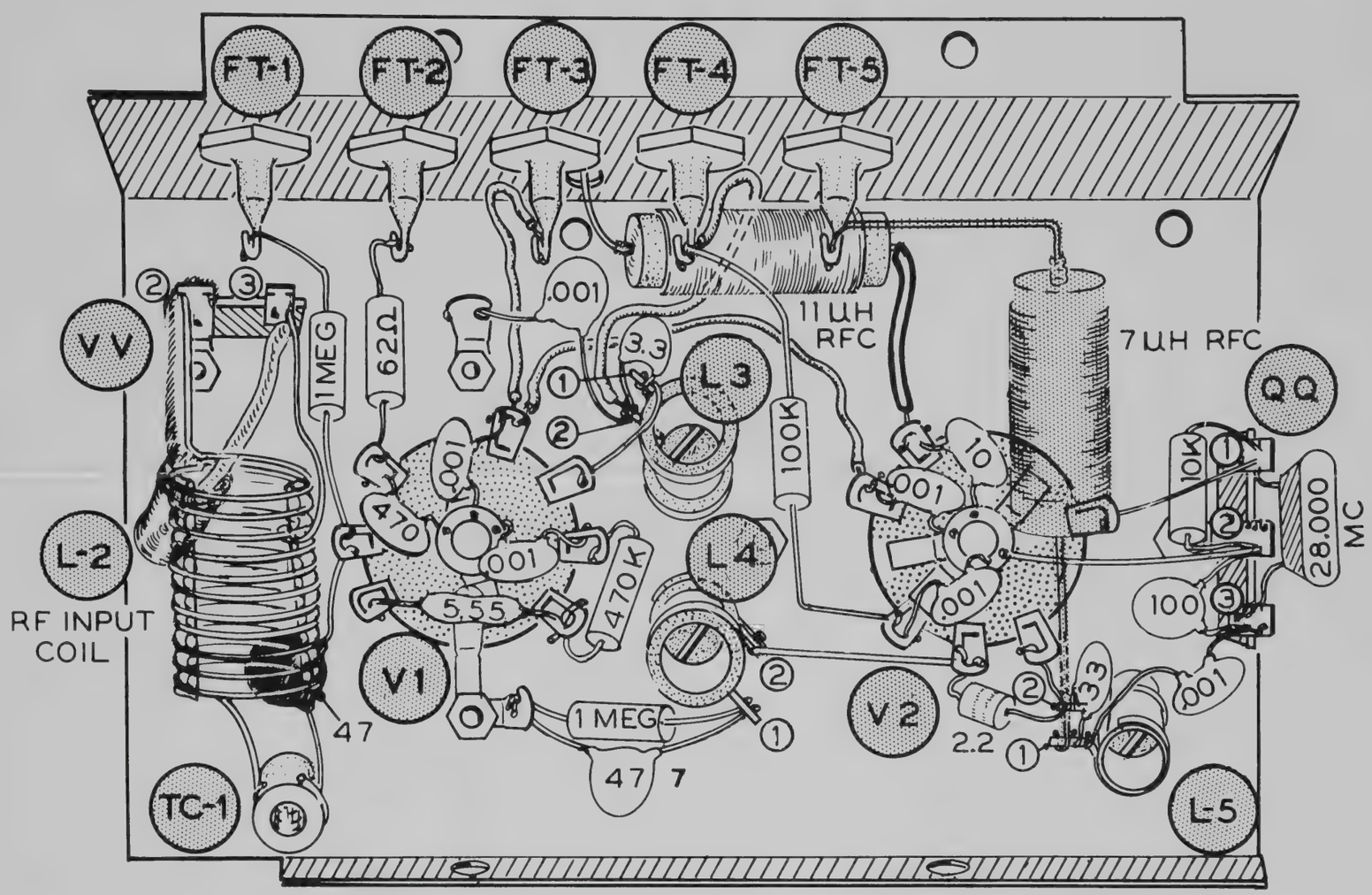

FT-6
RL-1
EE
MC
PA
YEL
ORG
1K
10K
BRN
BLK
YEL
RED
BLU
BO#6
BO#7
ORG
+ 2 UFD -
+ 8-8 UFD -
FF
JJ
2UFD
33K
MARKED CABLE
470K
270K
GG
.02
56K
HH
50 UFD
BLK
WHT
33K
V10
V11
100K
T2
D
E

Pictorial 9

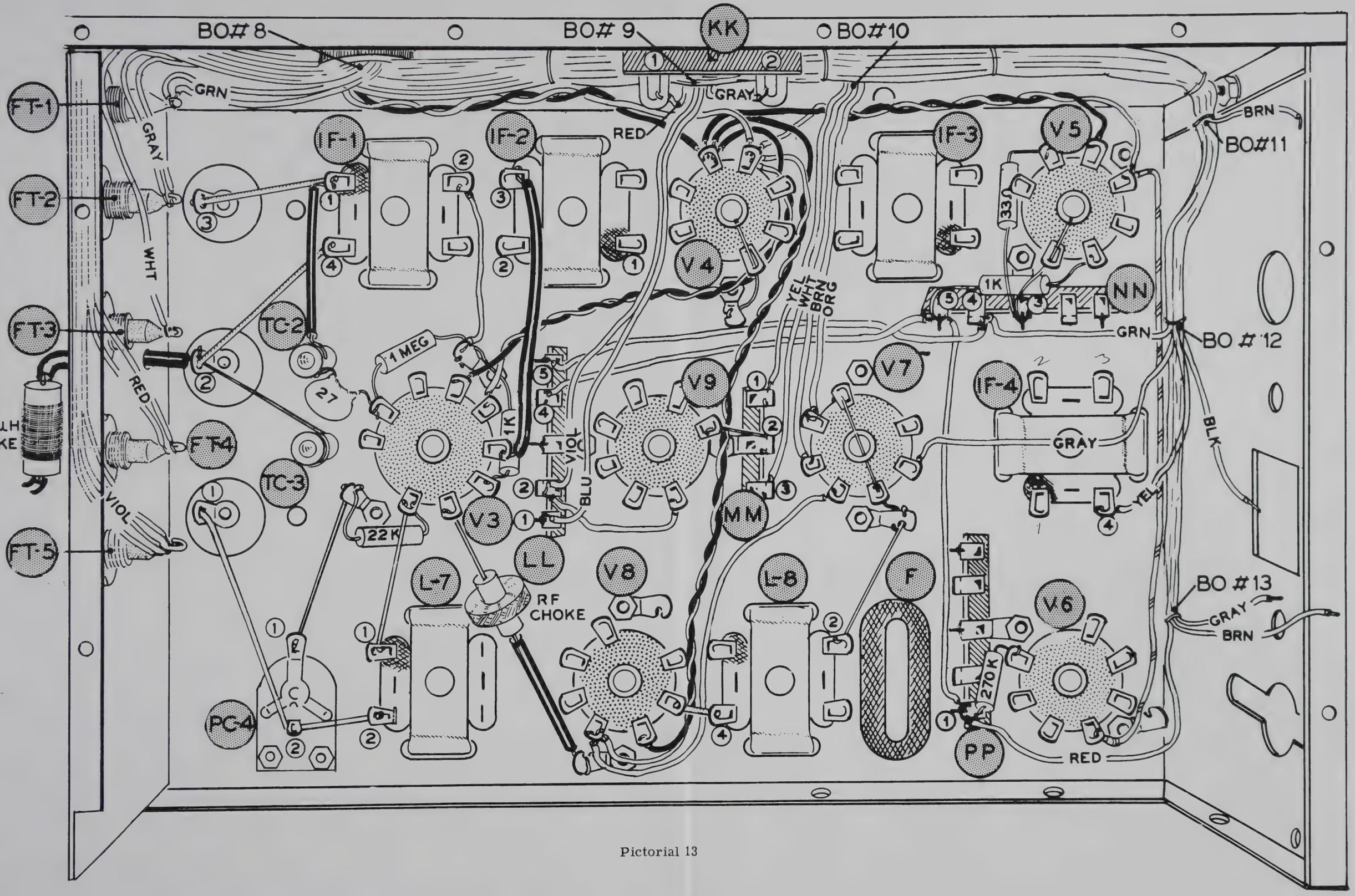


Pictorial 11

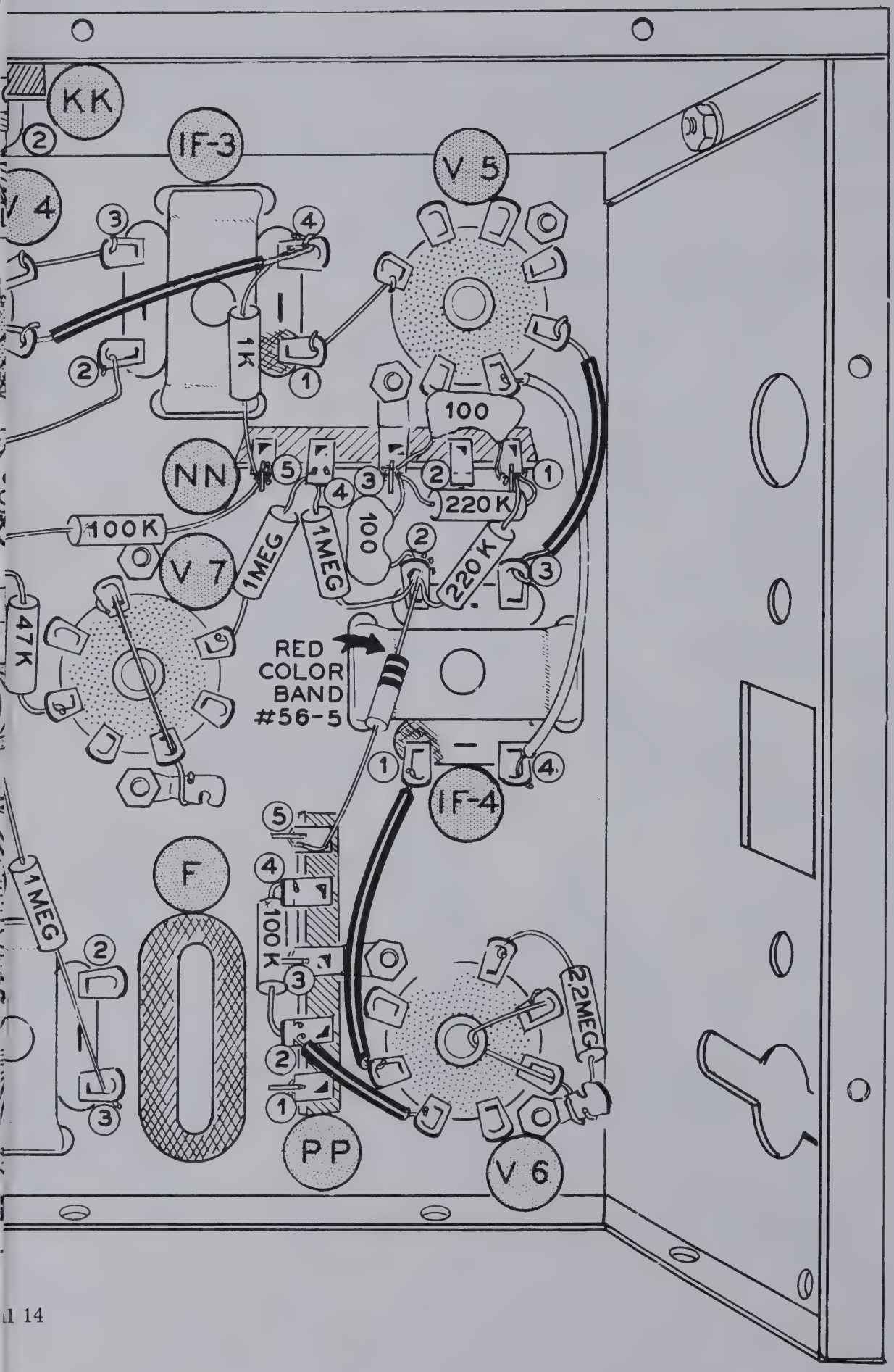

IF-1
IF-2
33 Ω
100 K
.005
47K
100K
1K
.56
470K
V 9
.005
V 3
100
10K
MM
LL
100K
L-8
50
50
L-7
39K
100
V 8

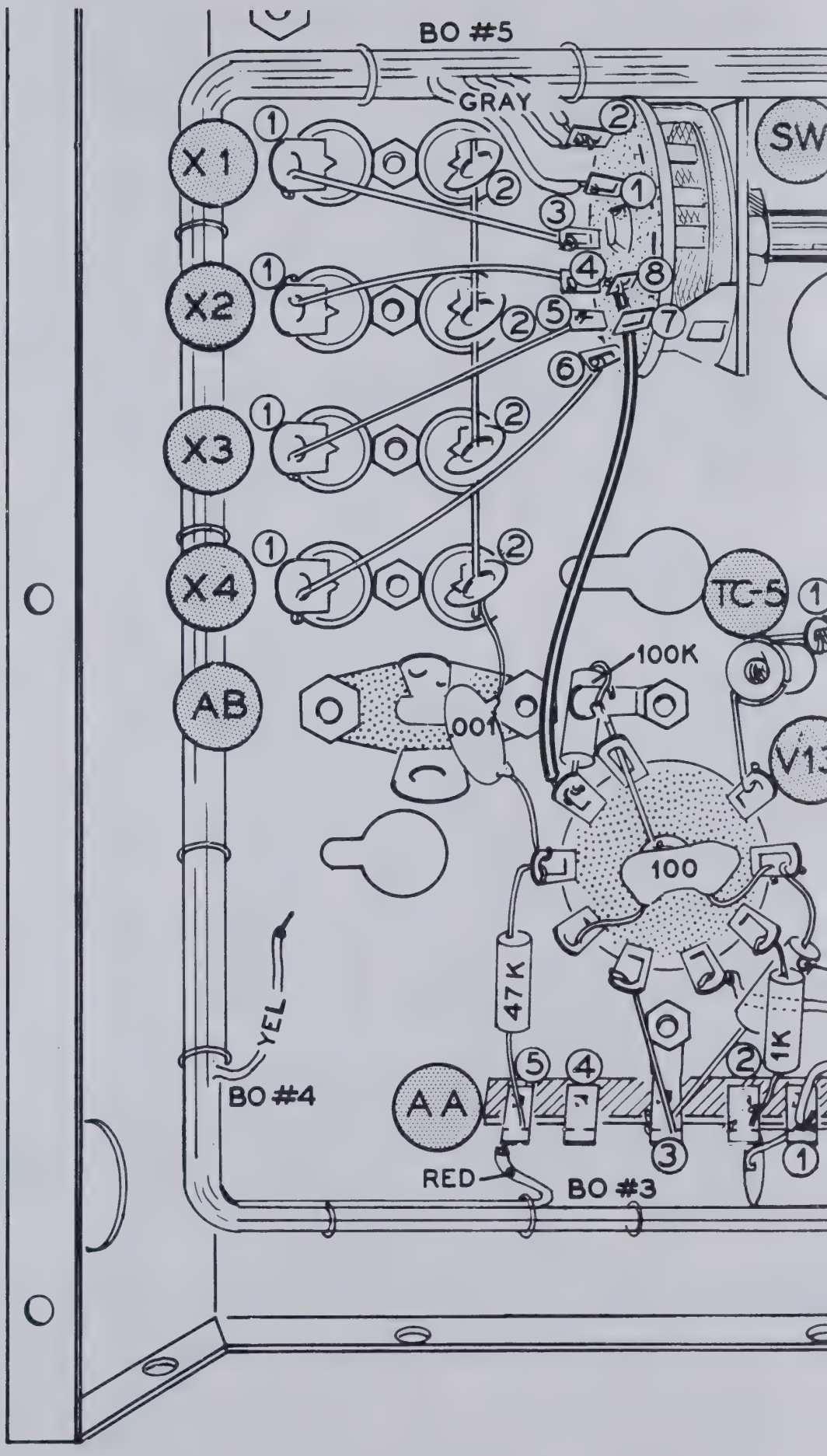


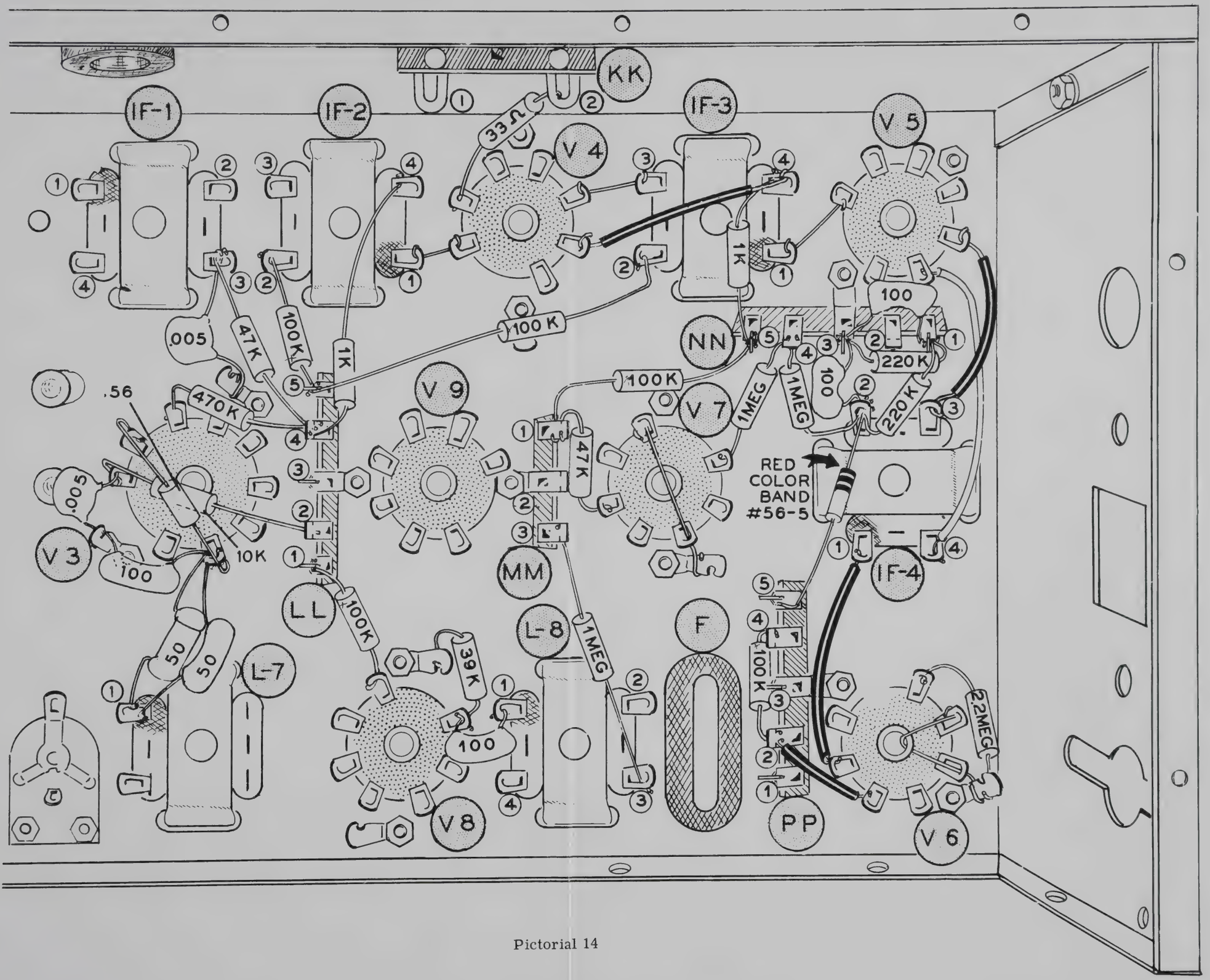
Pictorial 11



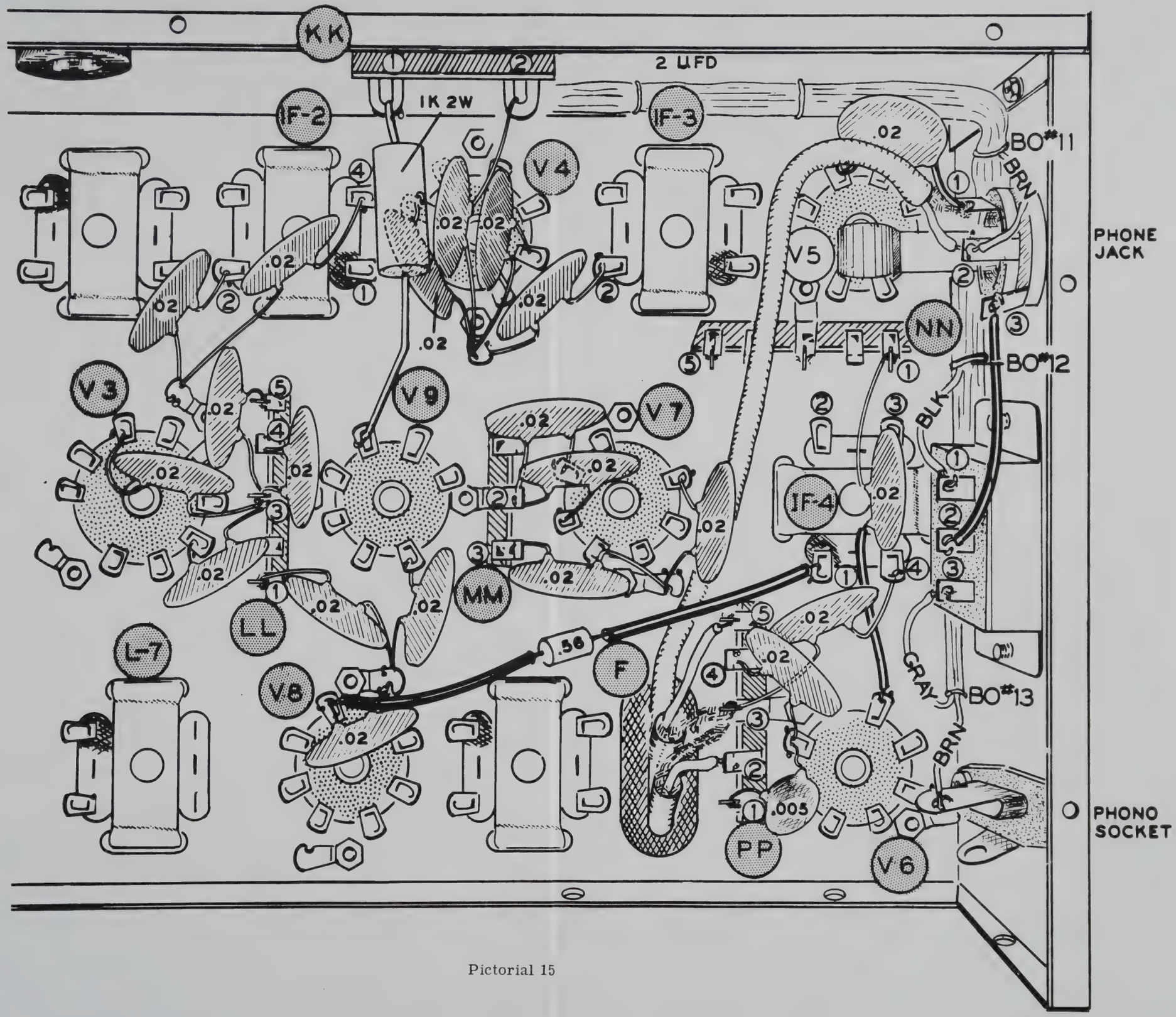
Pictorial 13


KK
IF-3
V 5
V 4
1K
100
NN
220K
100K
V 7
1MEG
1MEG
100
220K
47K
RED
COLOR
BAND
#56-5
IF-4
F
1MEG
100K
2.2MEG
PP
V 6

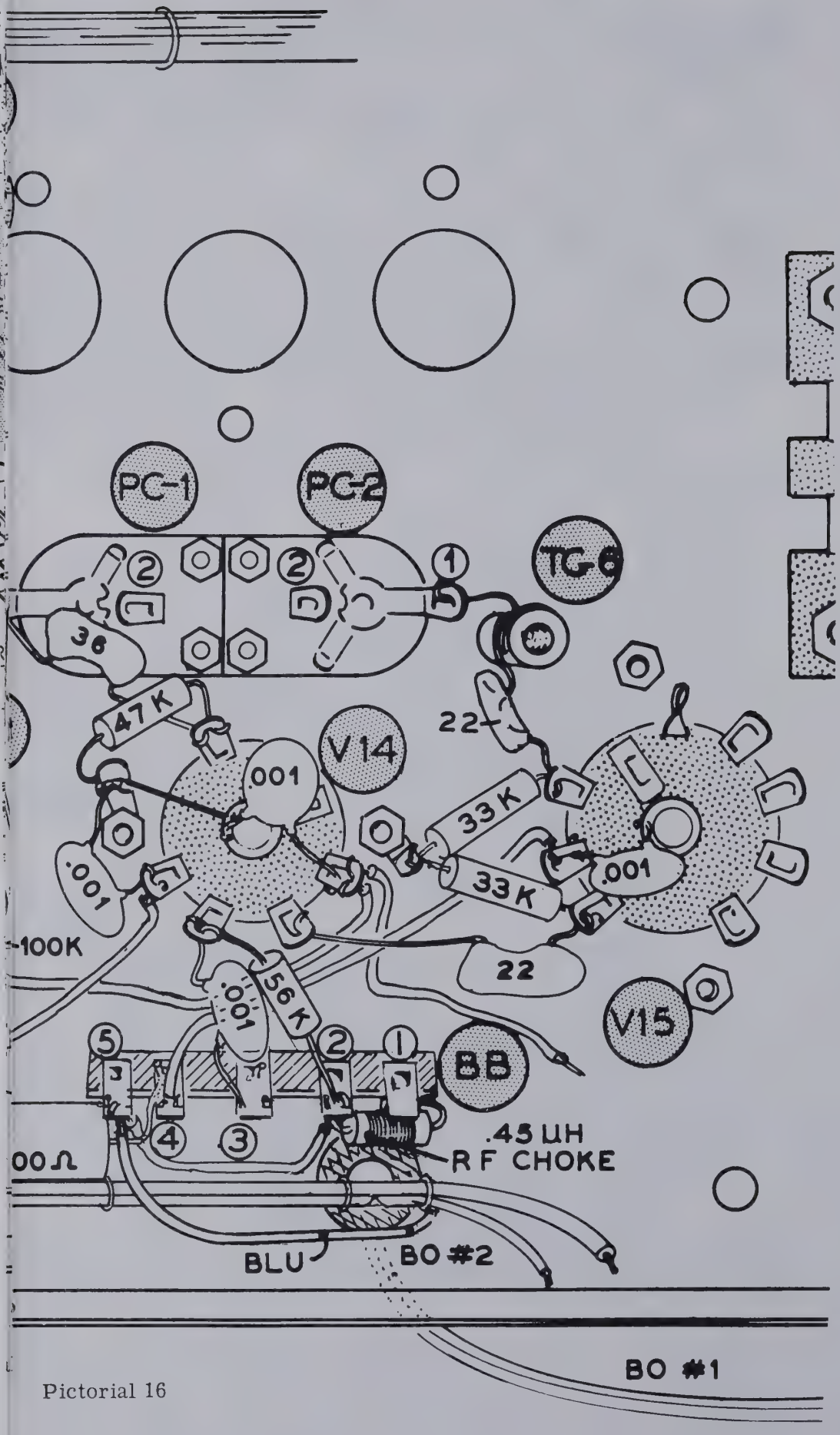

BO #5
GRAY
X1
X2
X3
X4
AB
SW
TC-5
100K
001
100
47K
1K
YEL
BO #4
AA
RED
BO #3



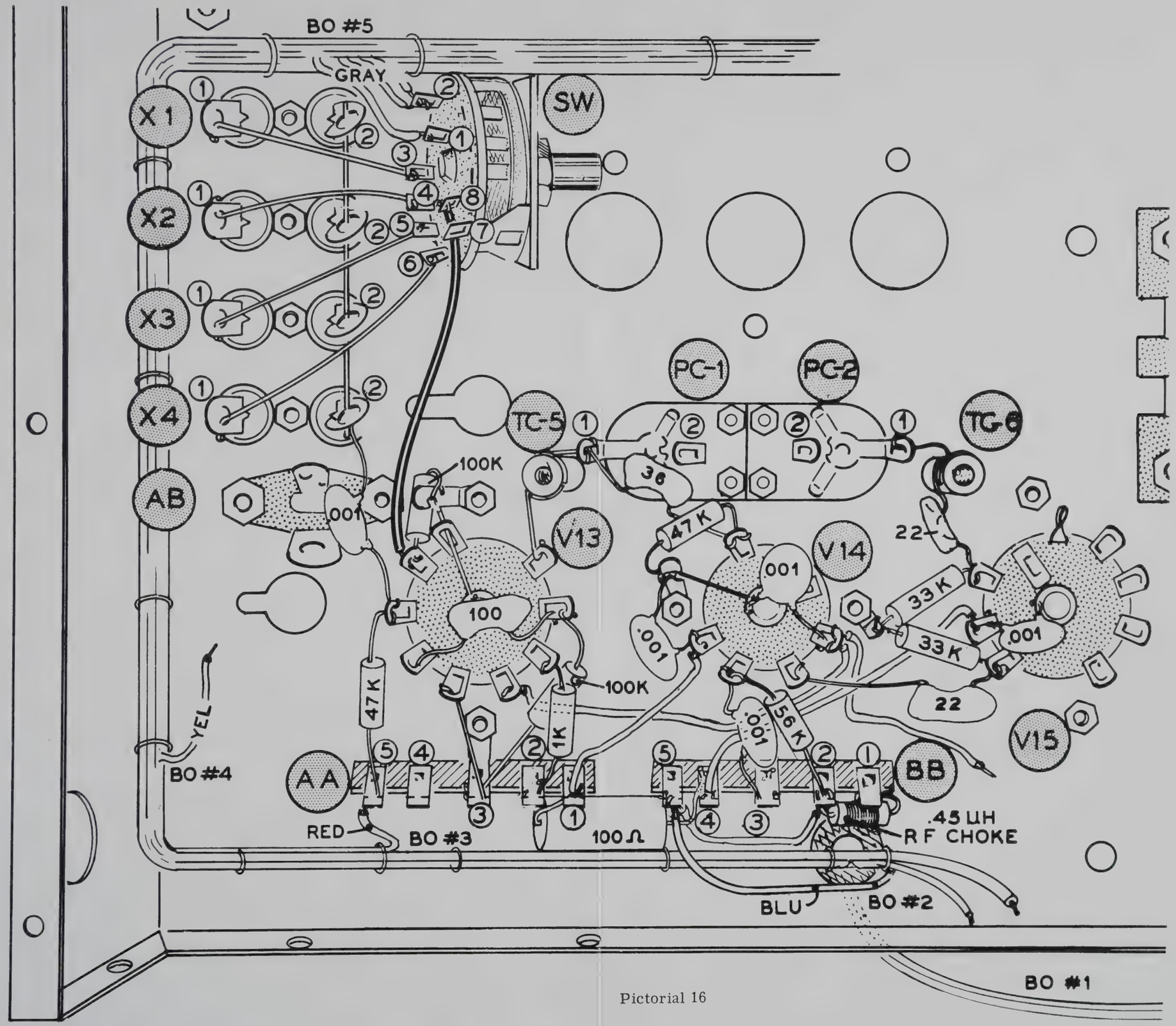
Pictorial 14



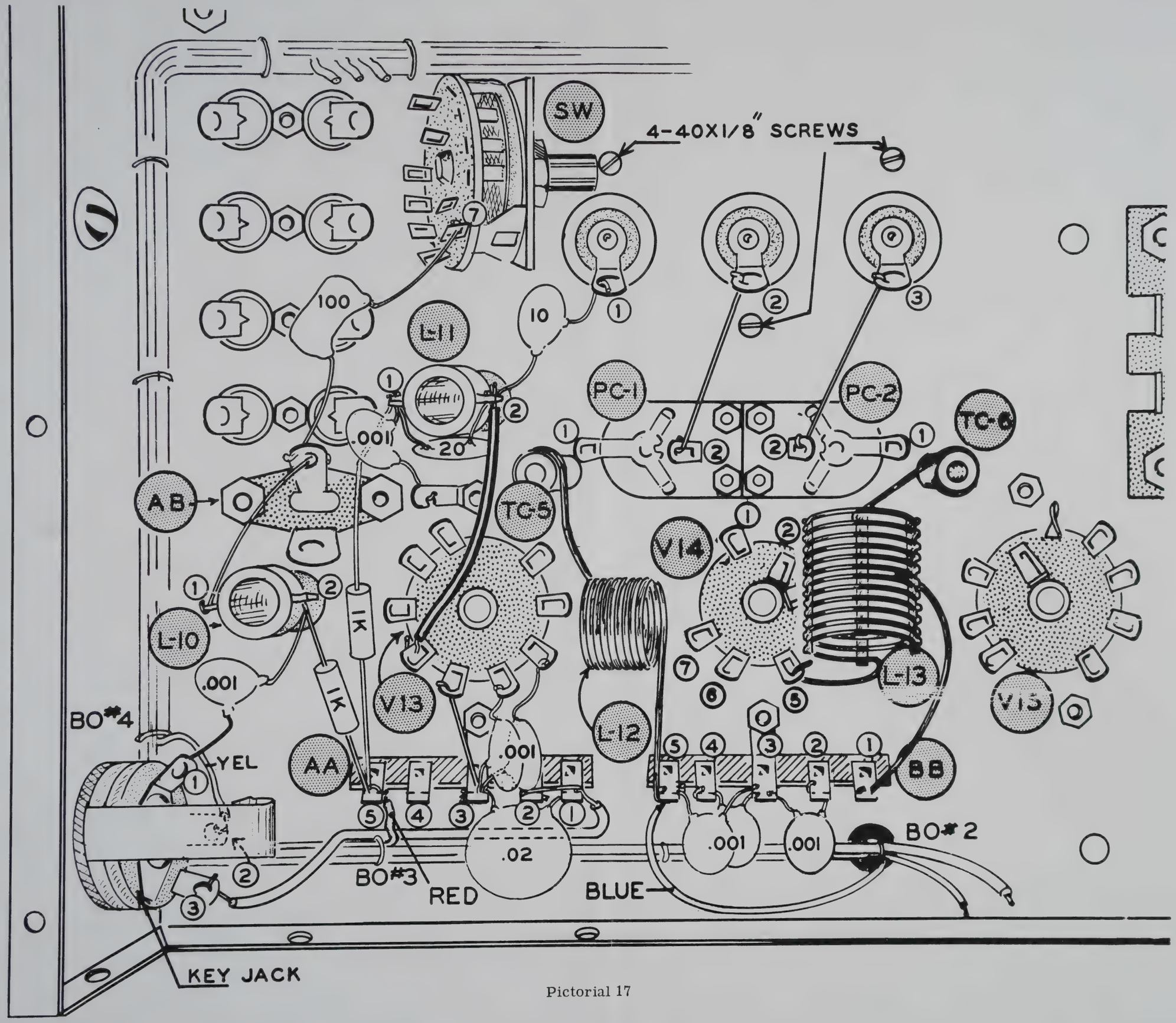
Pictorial 15



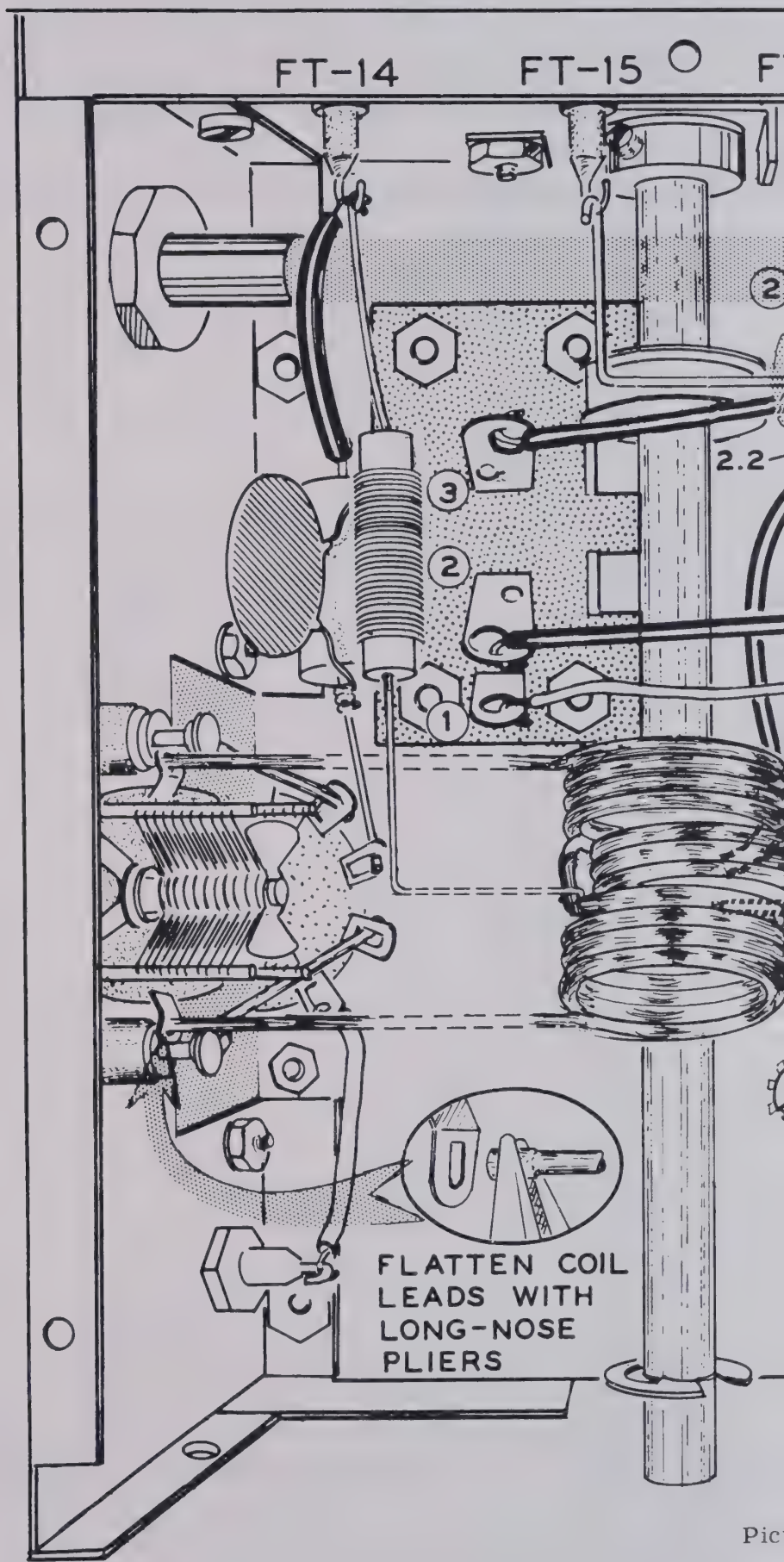
Pictorial 16



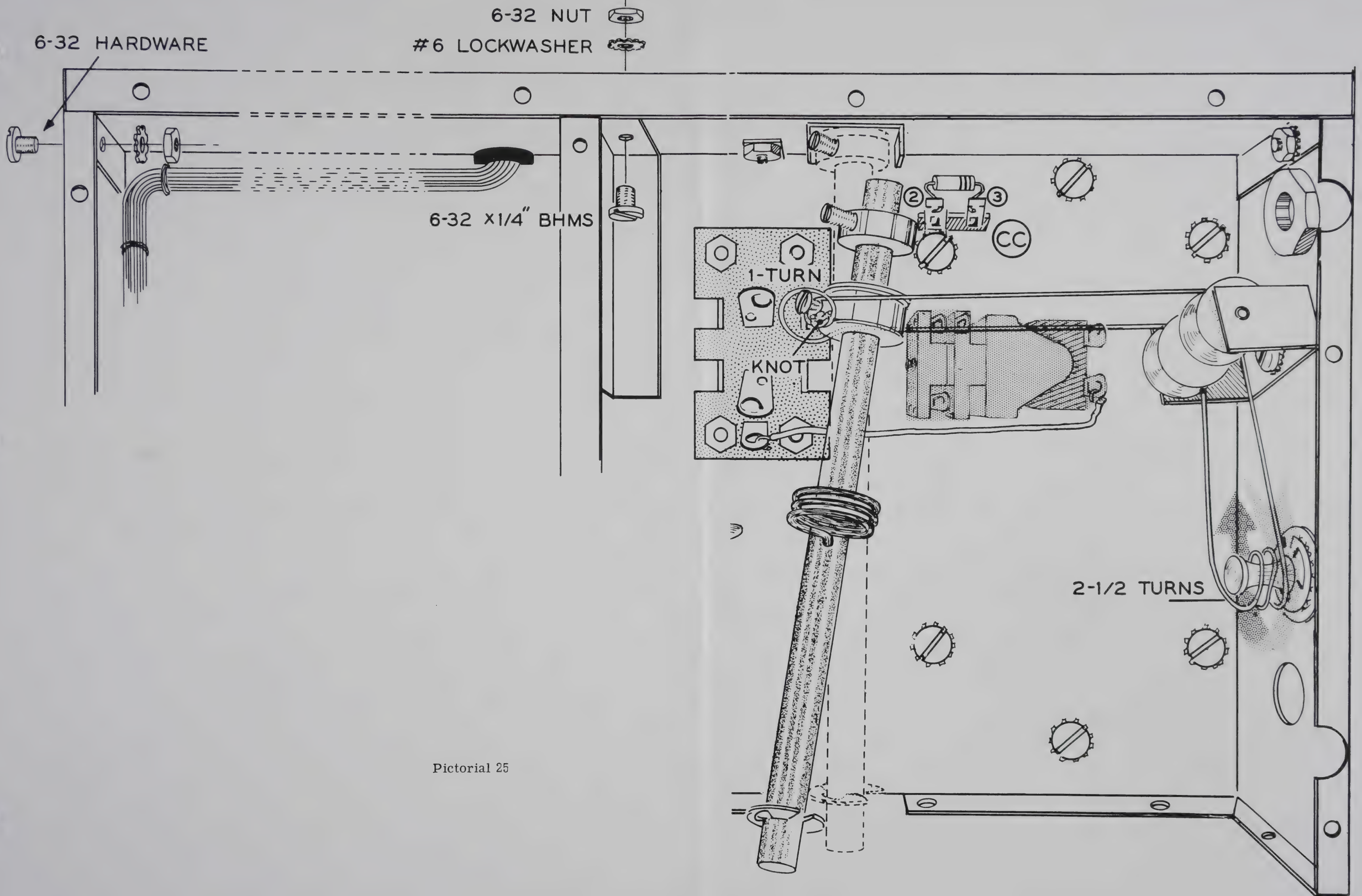
Pictorial 16



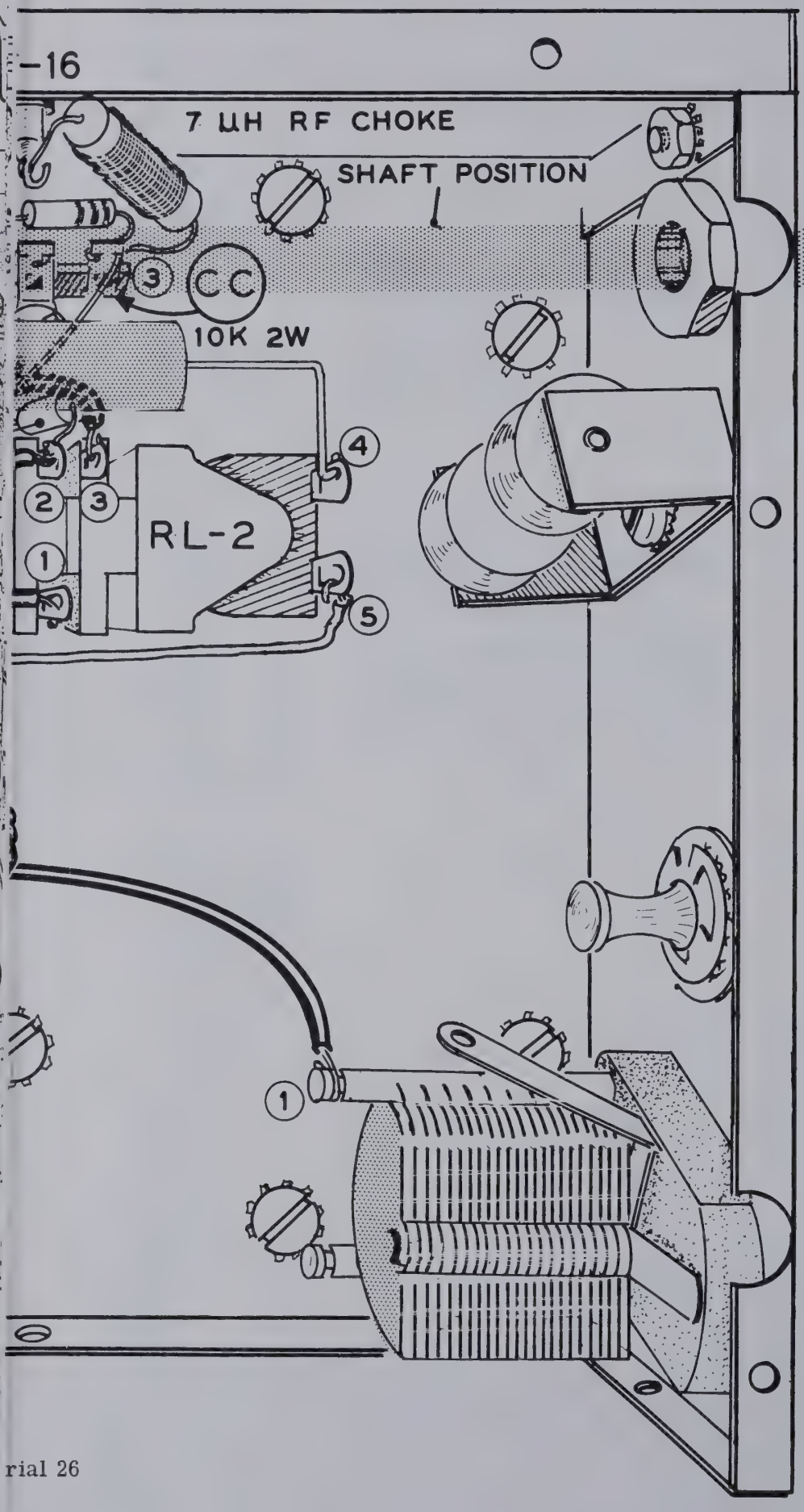
Pictorial 17



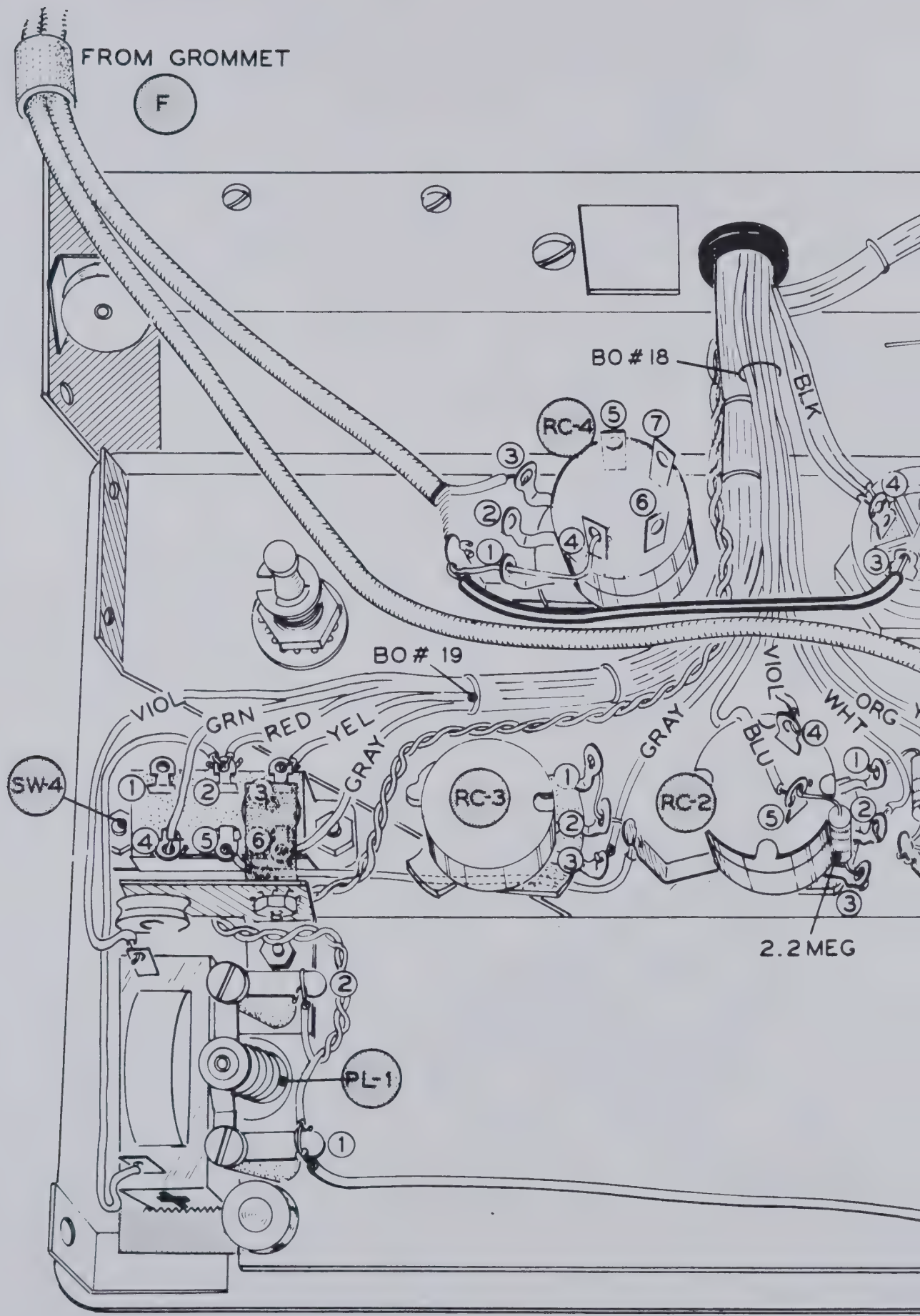
Pic



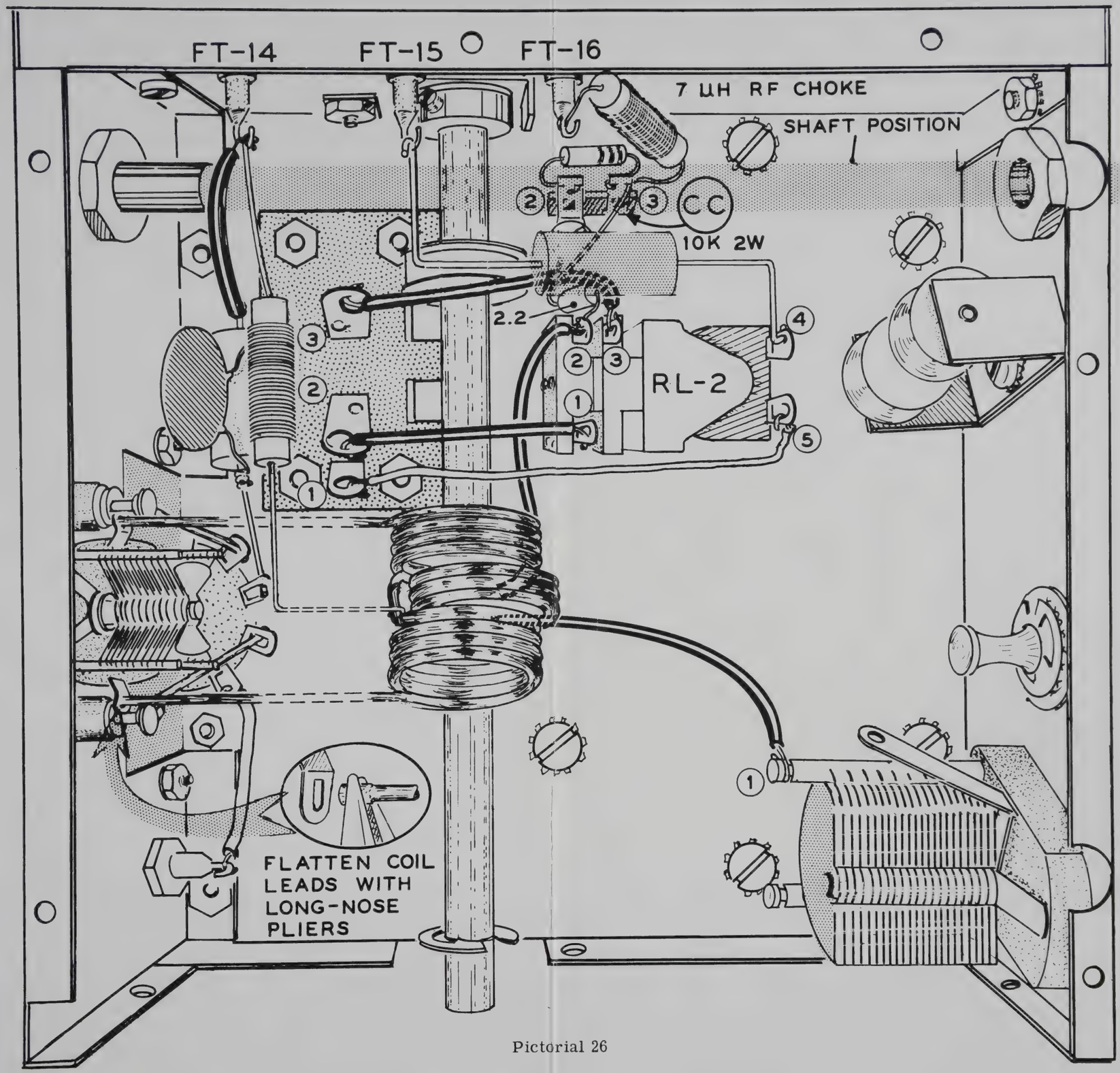
Pictorial 25



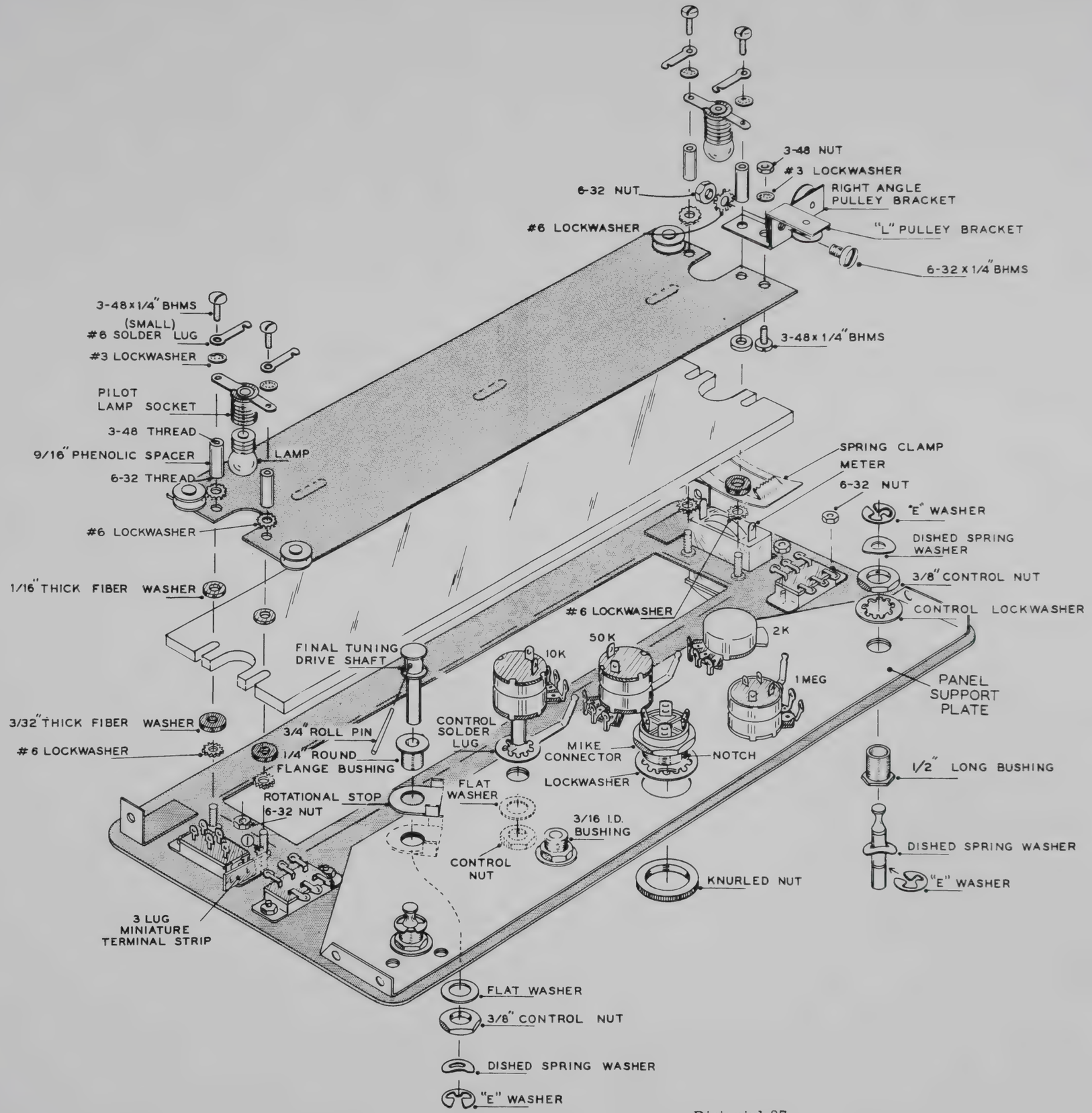
rial 26


FROM GROMMET
F
BO # 18
BLK
RC-4
BO # 19
VIOL
GRN
RED
YEL
GRAY
SW-4
RC-3
RC-2
VIOL
WHT
ORG
BLU
2.2 MEG
PL-1

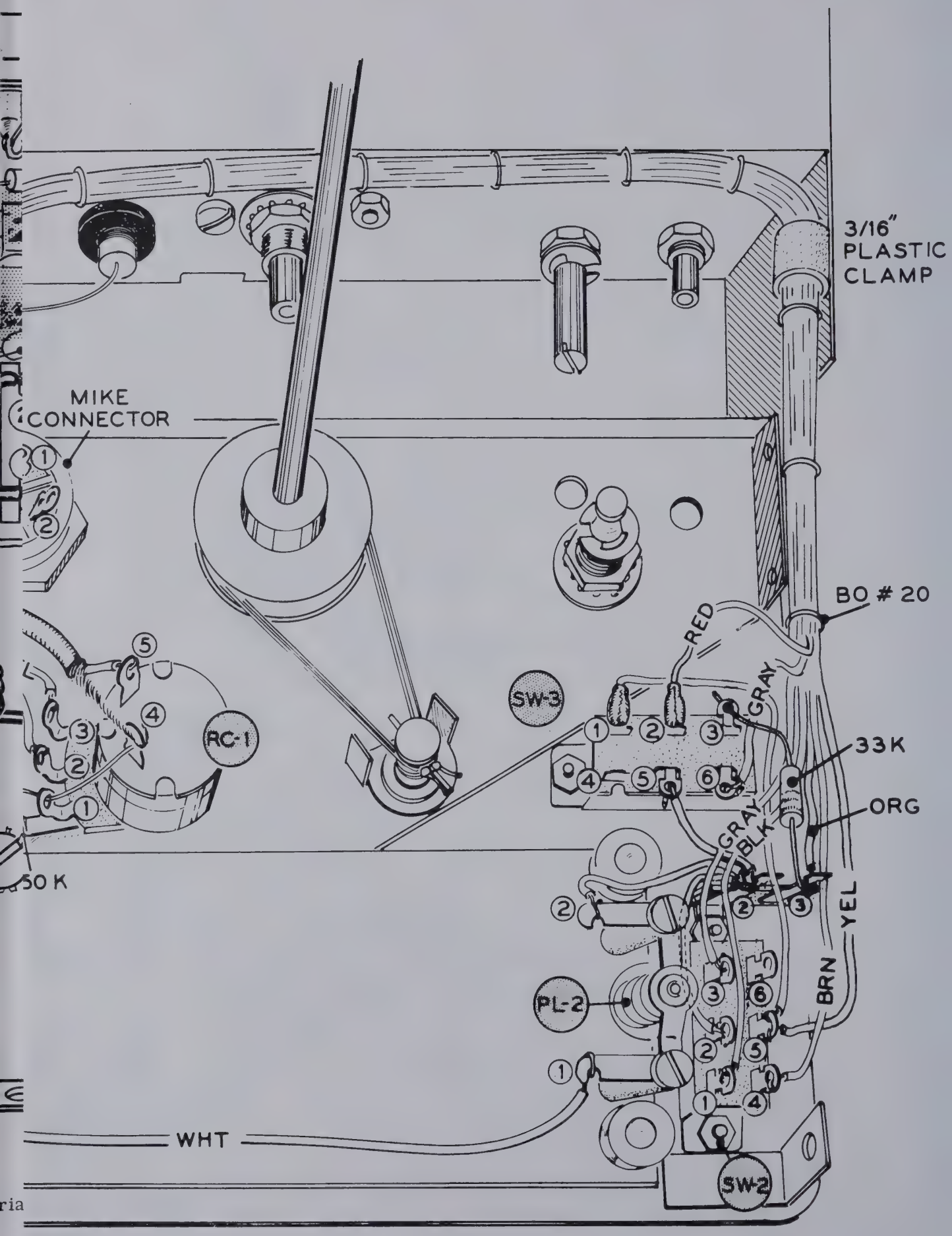
Pict

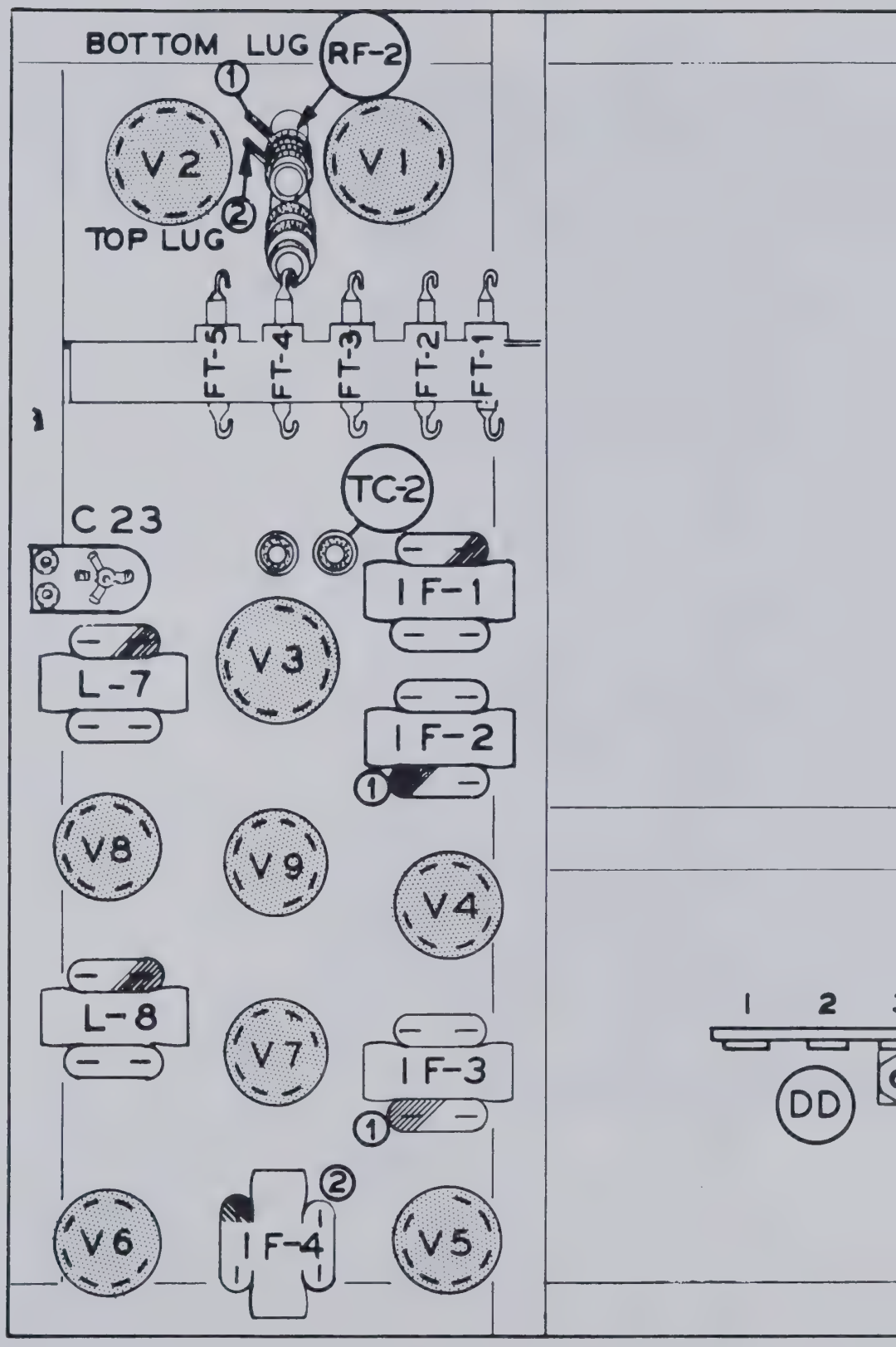


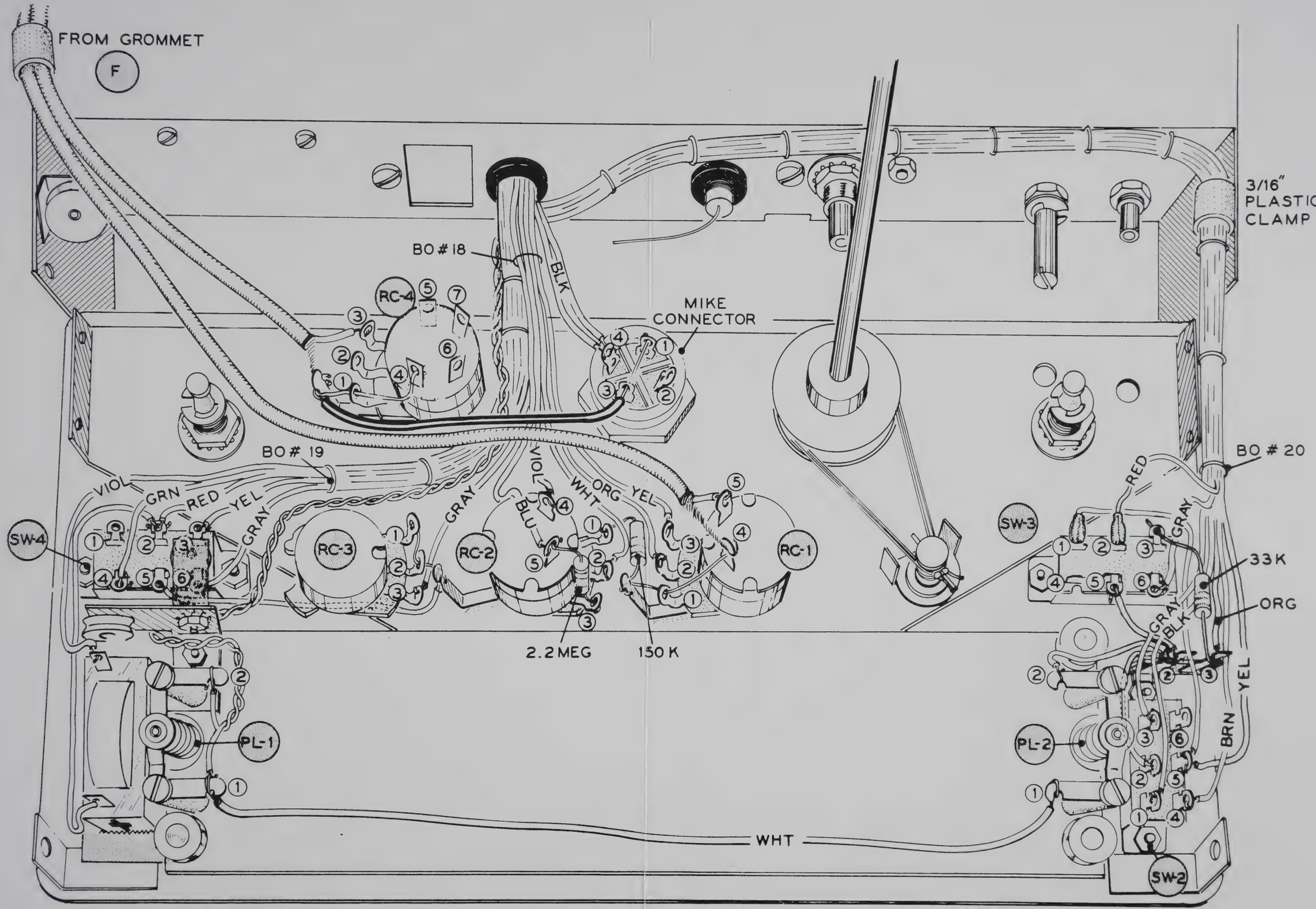
Pictorial 26



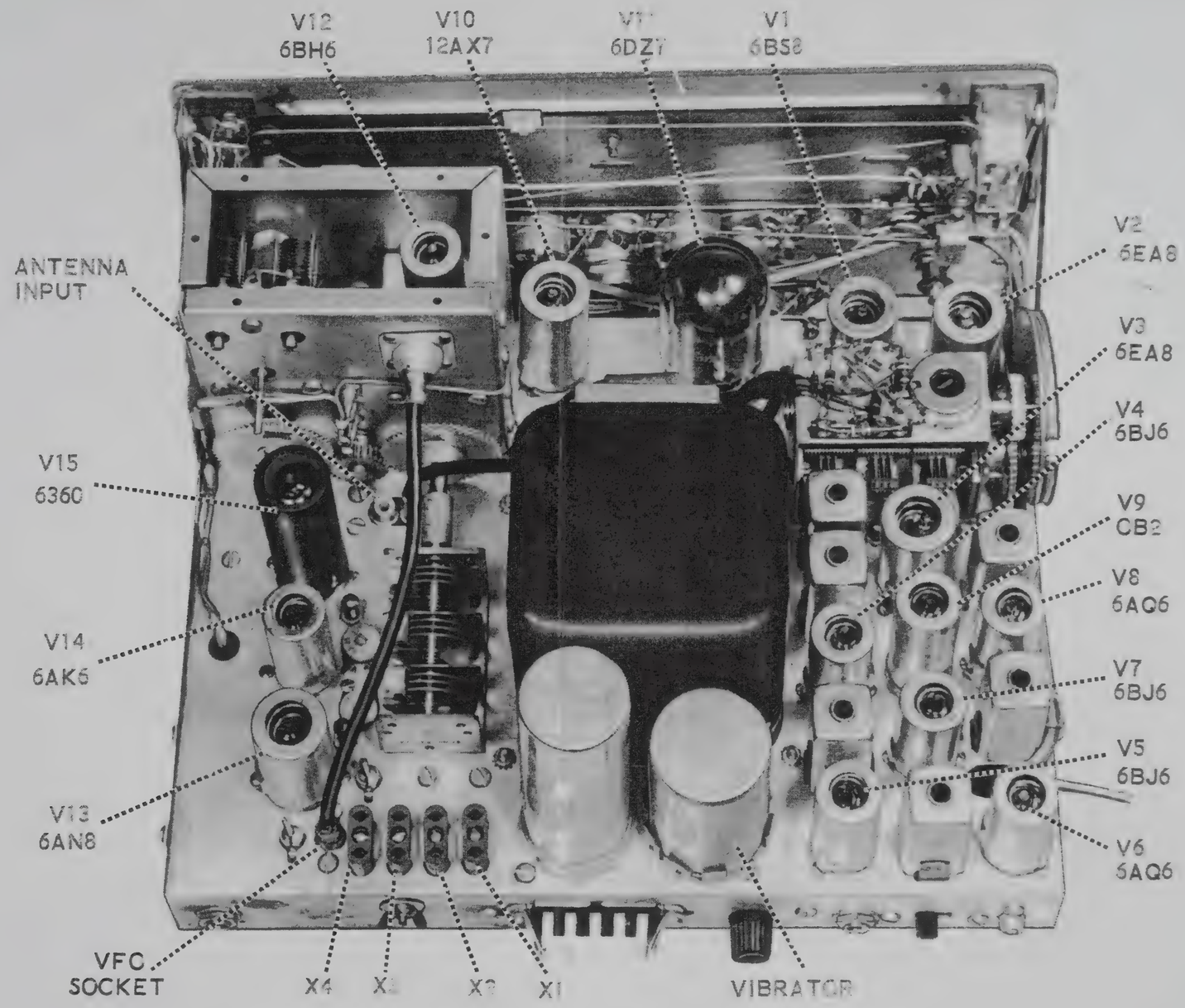
Pictorial 27


3/16" PLASTIC CLAMP
MIKE CONNECTOR
BO # 20
RED
GRAY
GRAY
SW-3
33K
ORG
GRAY
BLK
YEL
BRN
RC-1
50 K
PL-2
WHT
SW-2

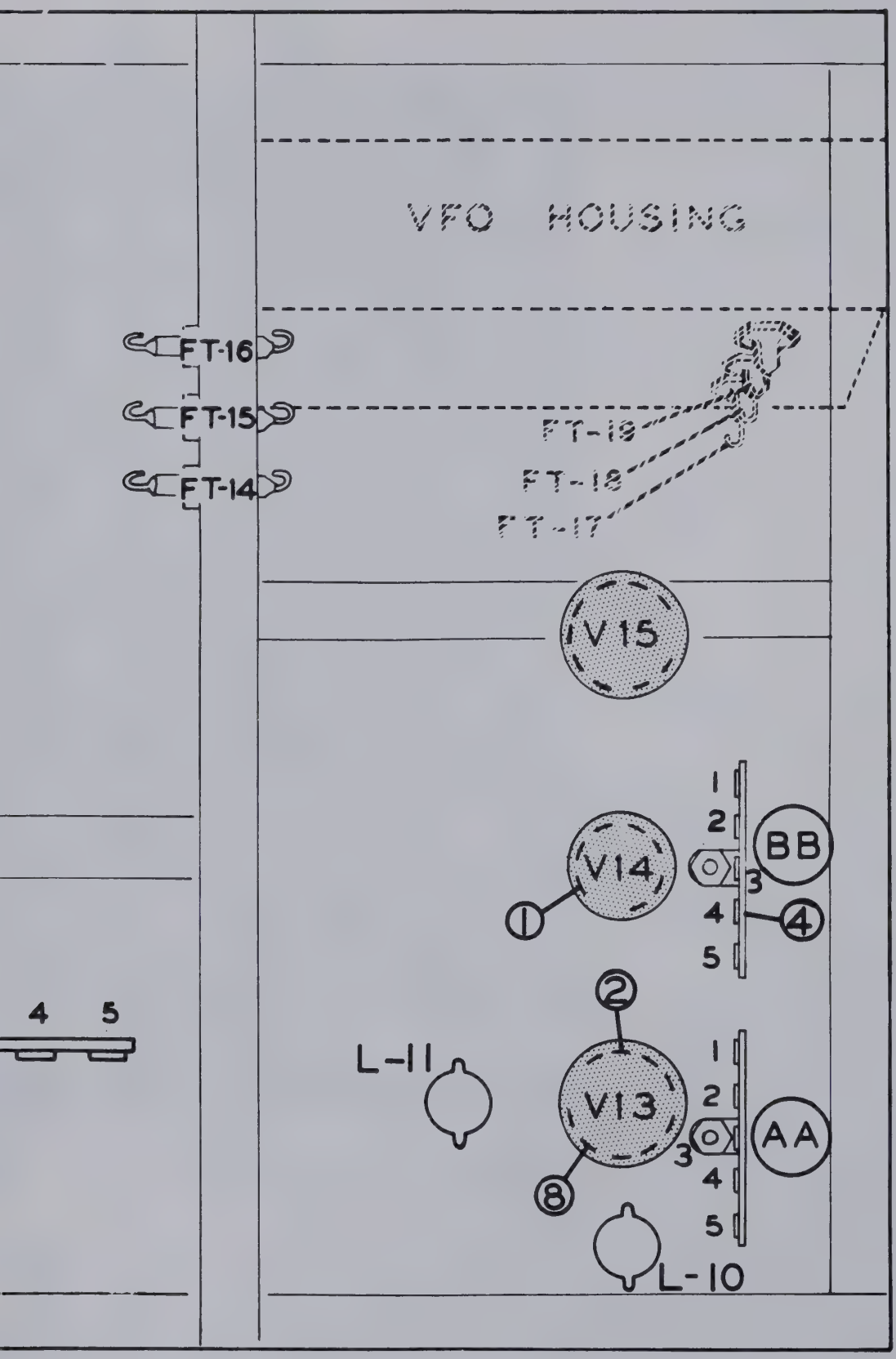

BOTTOM LUG
RF-2
1
2
V2
V1
TOP LUG
FT-5
FT-4
FT-3
FT-2
FT-1
TC-2
C 23
IF-1
V3
L-7
IF-2
1
V8
V9
V4
L-8
V7
IF-3
1
2
V6
IF-4
V5
1
2
DD

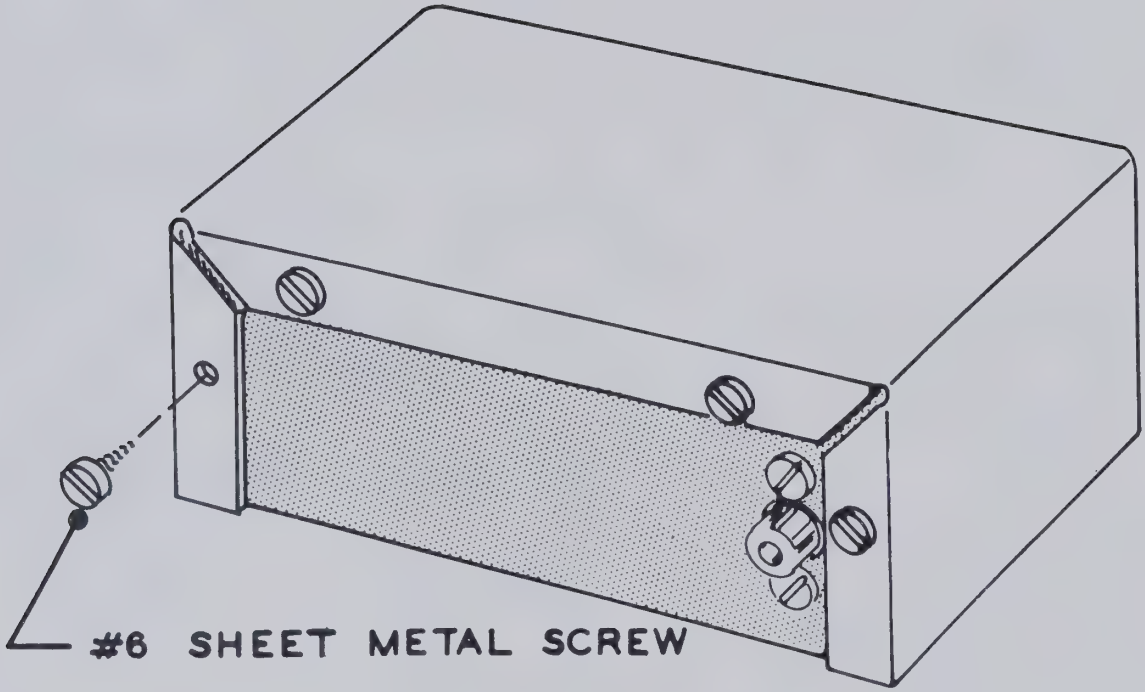


Pictorial 28

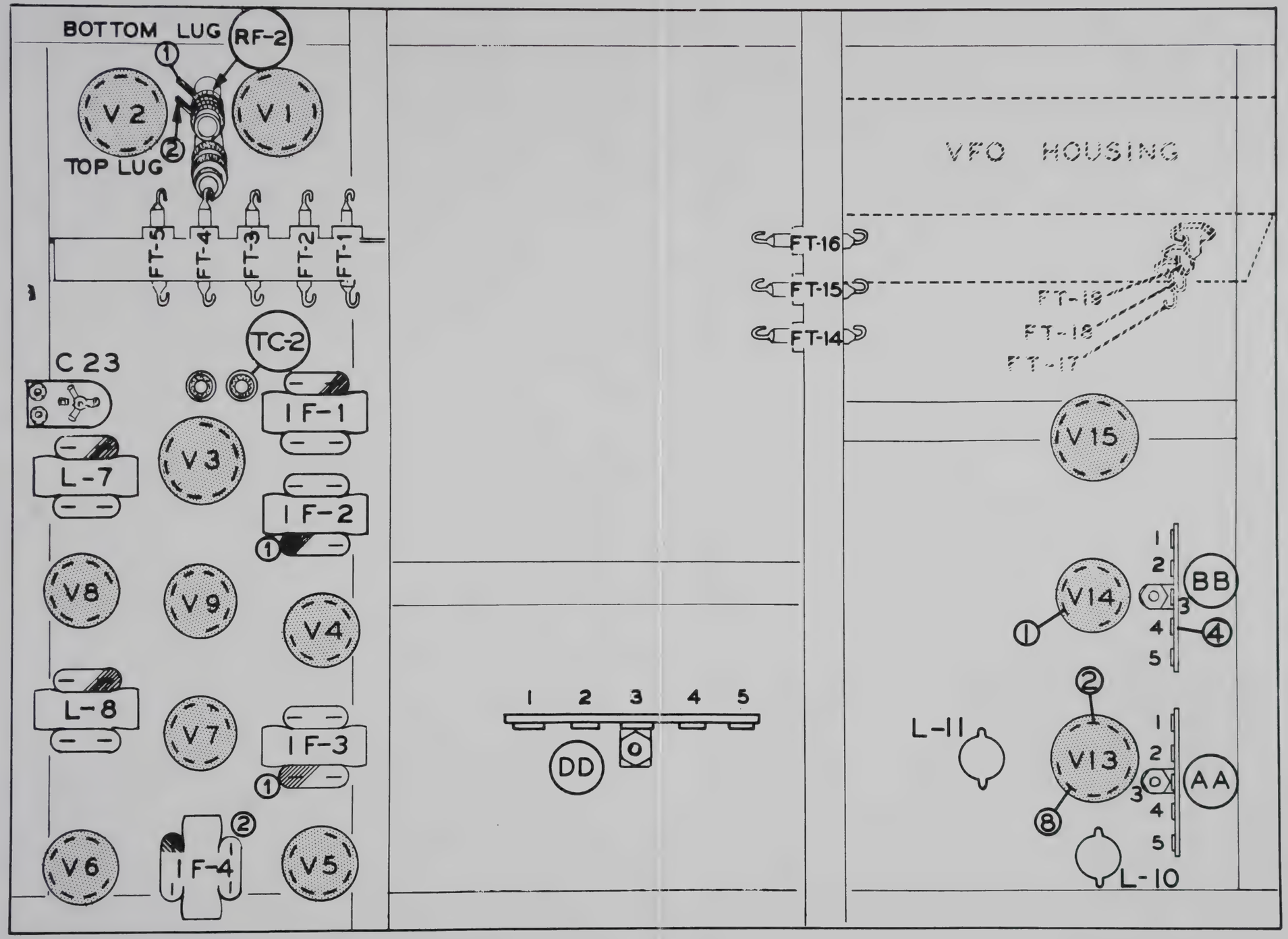


Pictorial 33

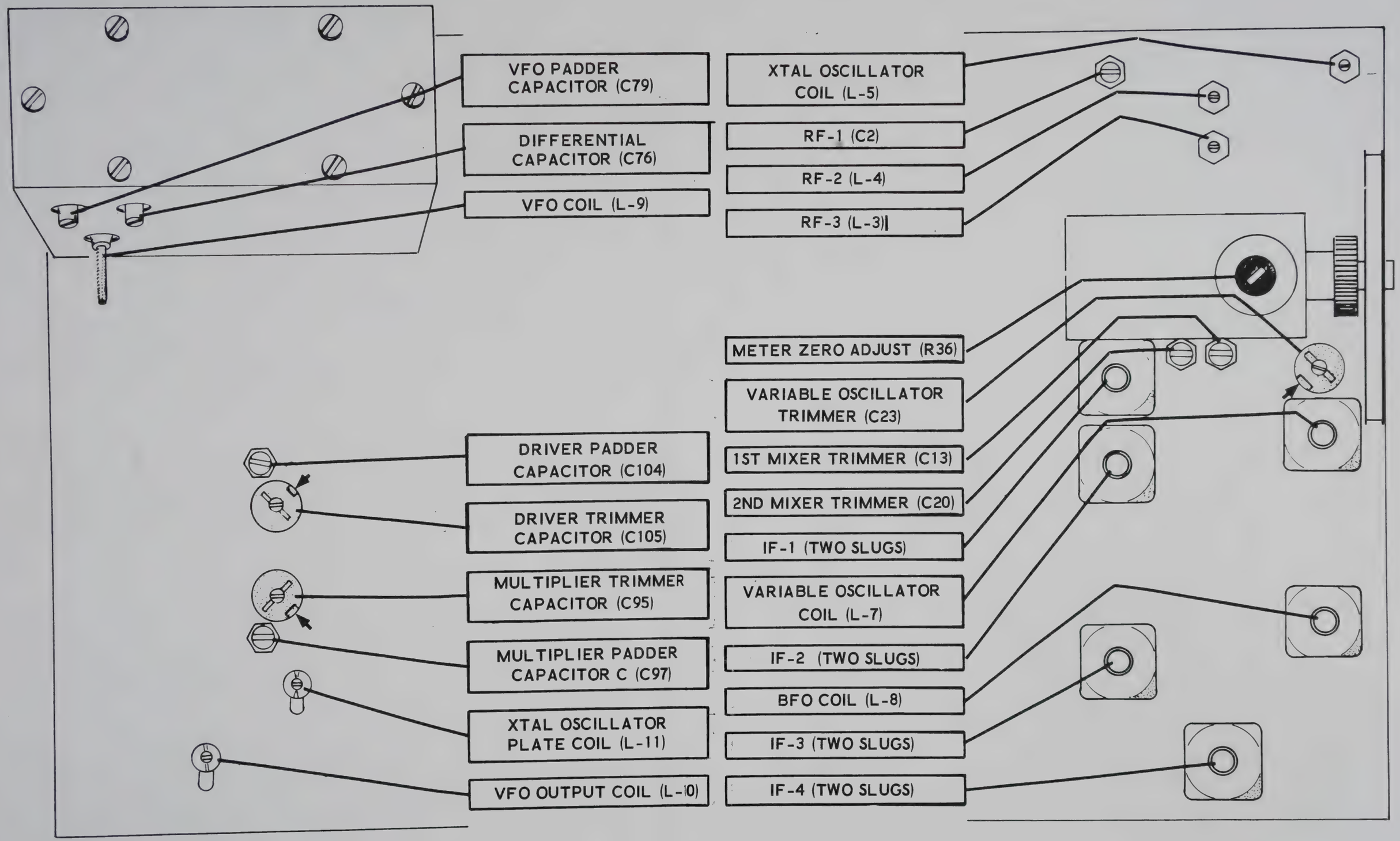

VFO HOUSING
FT-16
FT-15
FT-14
FT-19
FT-18
FT-17
V15
V14
BB
V13
AA
L-11
L-10
1
2
3
4
5
4
5



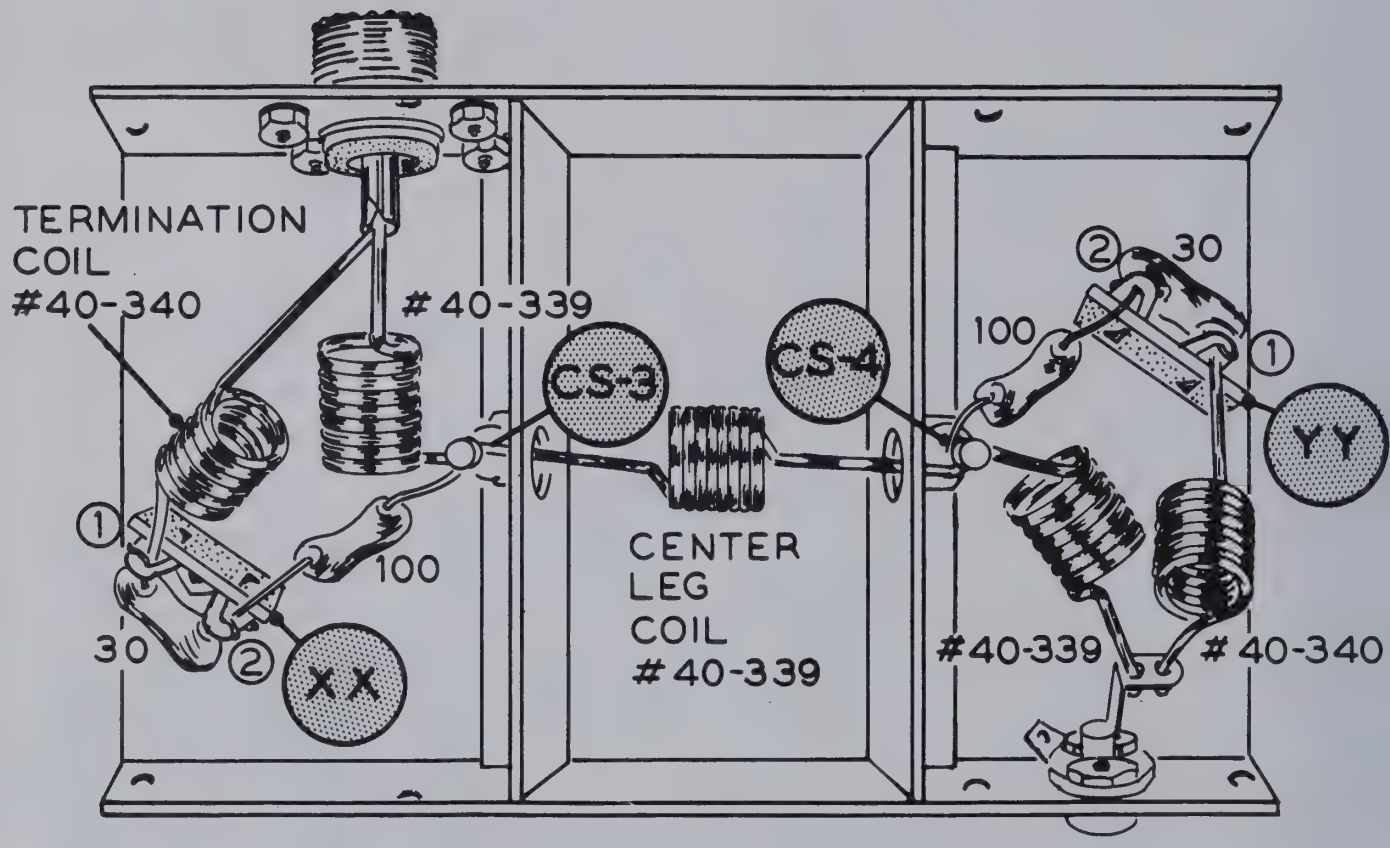
Detail 37A


BOTTOM LUG
RF-2
V2
V1
TOP LUG
FT-5
FT-4
FT-3
FT-2
FT-1
TC-2
C 23
IF-1
V3
L-7
IF-2
V8
V9
V4
L-8
V7
IF-3
V6
IF-4
V5
1 2 3 4 5
DD
VFO HOUSING
FT-16
FT-15
FT-14
FT-19
FT-18
FT-17
IV15
V14
BB
V13
AA
L-11
L-10

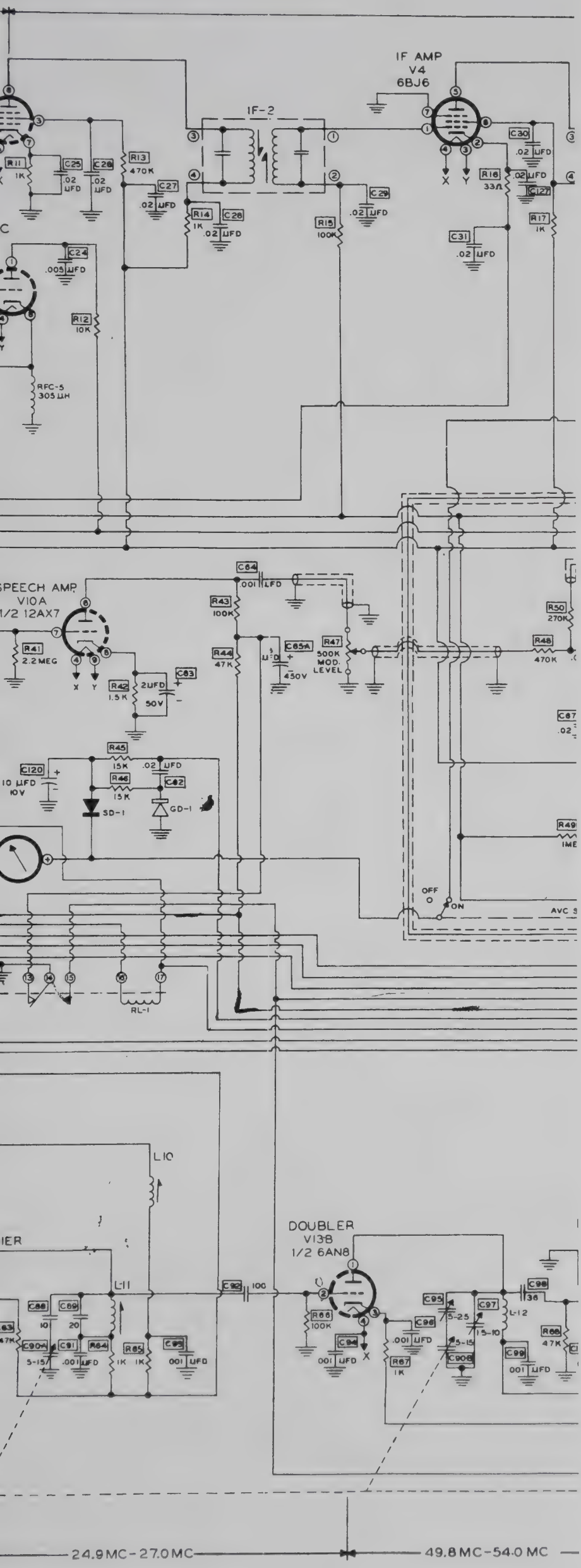
Detail34B

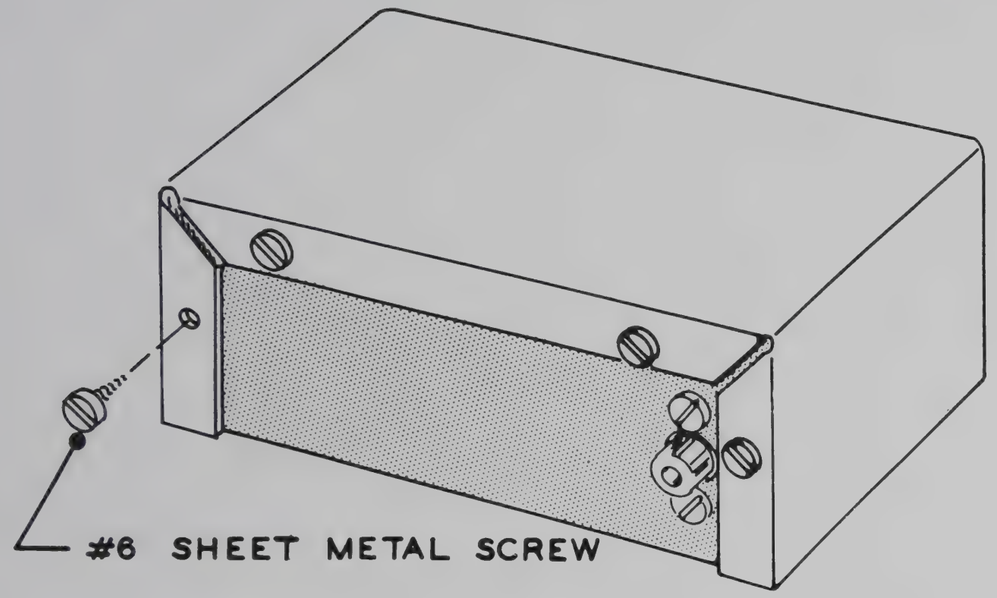

VFO PADDER CAPACITOR (C79)
DIFFERENTIAL CAPACITOR (C76)
VFO COIL (L-9)
XTAL OSCILLATOR COIL (L-5)
RF-1 (C2)
RF-2 (L-4)
RF-3 (L-3)
METER ZERO ADJUST (R36)
VARIABLE OSCILLATOR TRIMMER (C23)
1ST MIXER TRIMMER (C13)
2ND MIXER TRIMMER (C20)
IF-1 (TWO SLUGS)
VARIABLE OSCILLATOR COIL (L-7)
IF-2 (TWO SLUGS)
BFO COIL (L-8)
IF-3 (TWO SLUGS)
IF-4 (TWO SLUGS)
DRIVER PADDER CAPACITOR (C104)
DRIVER TRIMMER CAPACITOR (C105)
MULTIPLIER TRIMMER CAPACITOR (C95)
MULTIPLIER PADDER CAPACITOR C (C97)
XTAL OSCILLATOR PLATE COIL (L-11)
VFO OUTPUT COIL (L-10)

Pctorial 34

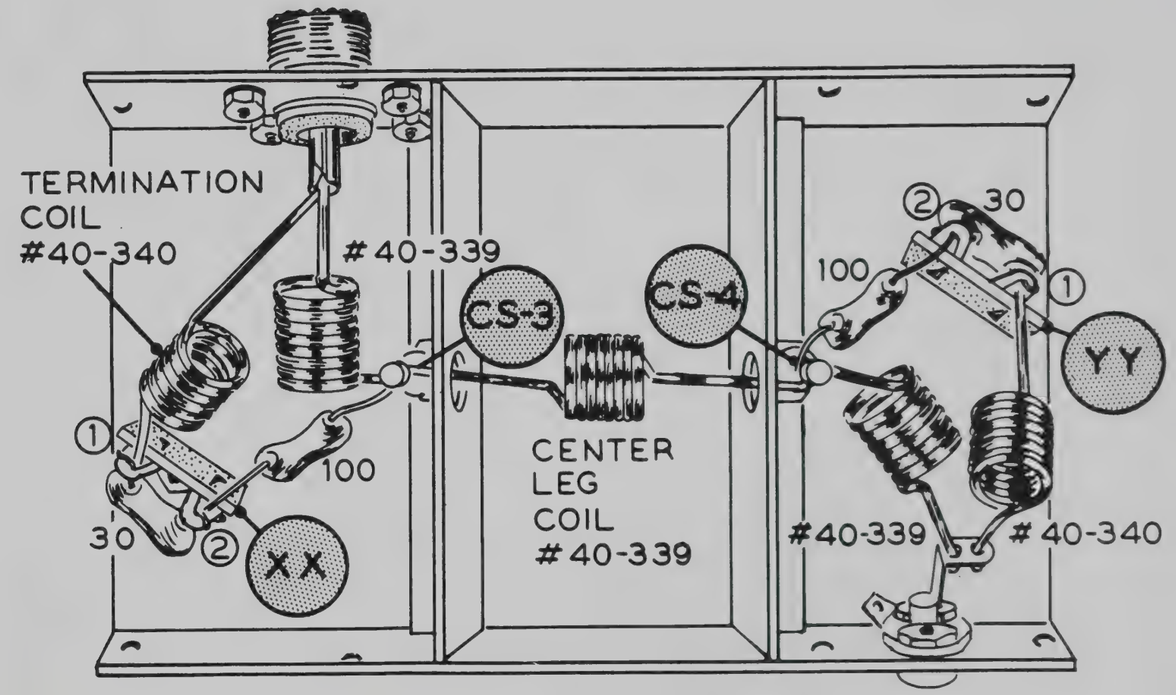


Pictorial 37

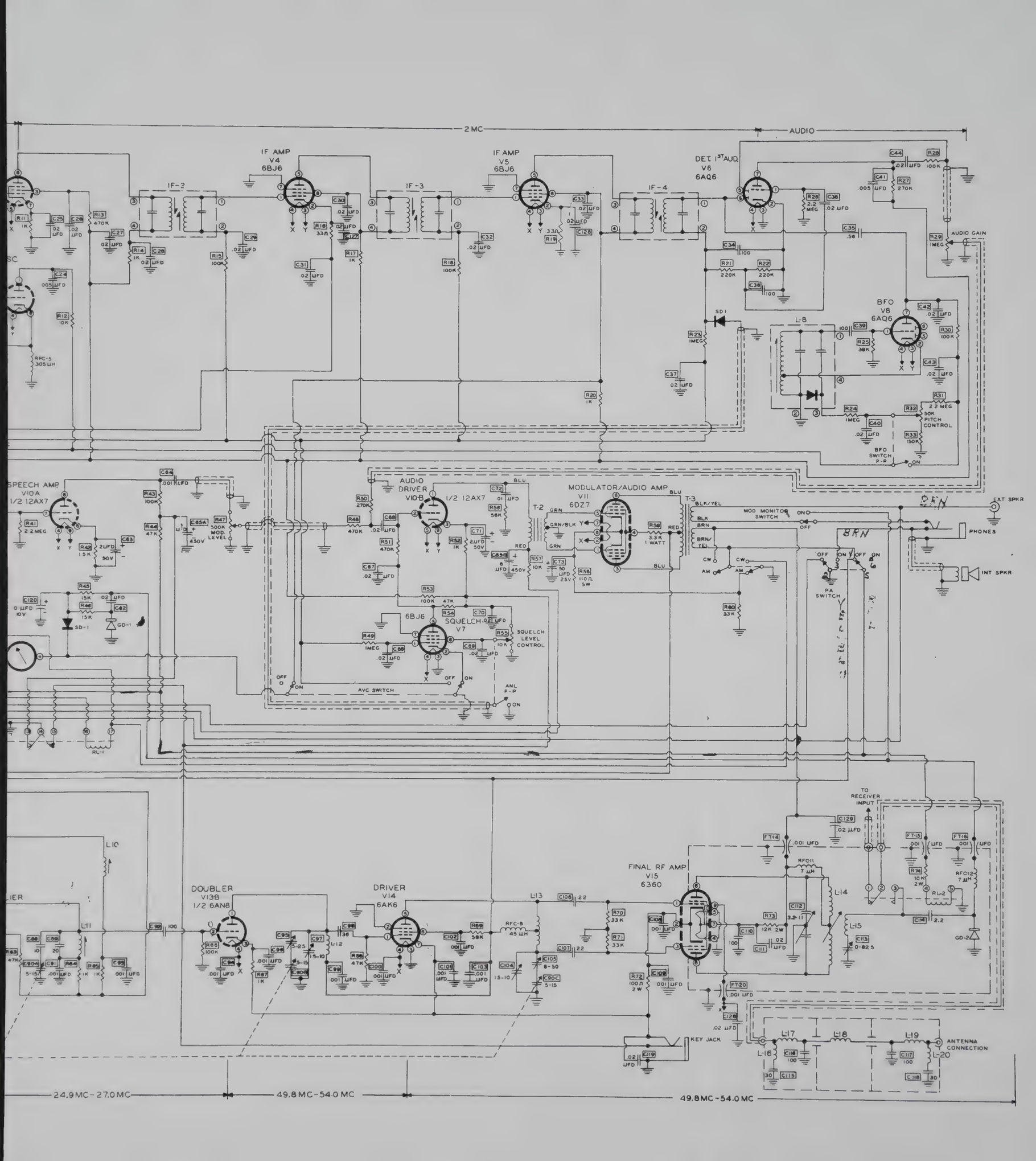

IF AMP
V4
6BJ6
IF-2
R13
470K
C27
.02 μFD
R14
1K
C28
.02 μFD
R15
100K
C29
.02 μFD
C30
.02 μFD
R16
33Λ
C127
.02 μFD
R17
1K
C31
.02 μFD
X
Y
C24
.005 μFD
R12
10K
RFC-5
305 μH
SPEECH AMP
V10A
1/2 12AX7
R41
2.2 MEG
R42
1.5K
C83
2 μFD
50V
C64
.001 μFD
R43
100K
R44
47K
C85A
μ-D
450V
R47
500K
MOD.
LEVEL
R50
270K
R48
470K
C87
.02
C120
10 μFD
10V
R45
15K
.02 μFD
R46
15K
C82
SD-1
GD-1
OFF
ON
AVC
RL-1
L10
L11
DOUBLER
V13B
1/2 6AN8
C92
100
R66
100K
C94
.001 μFD
R67
1K
C95
5-25
C97
L-12
5-10
C96
.001 μFD
C90B
5-15
C90B
C98
36
R68
47K
C99
.001 μFD
C88
10
C89
20
C90A
5-15
C91
.001 μFD
R64
1K
R65
1K
C93
.001 μFD
24.9MC-27.0MC
49.8MC-54.0 MC

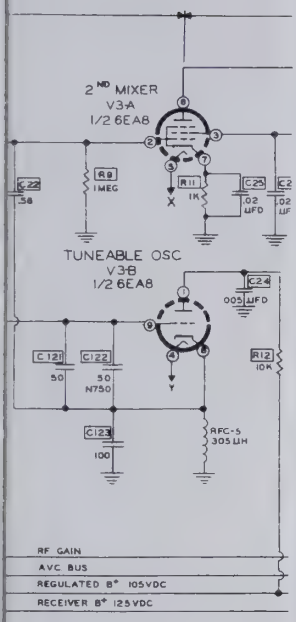


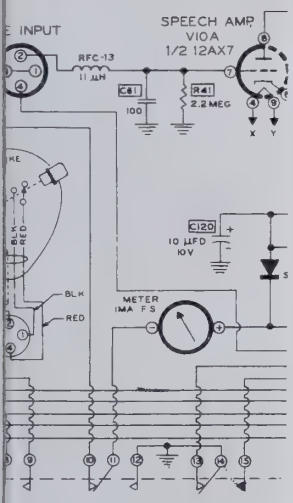
Detail 37A

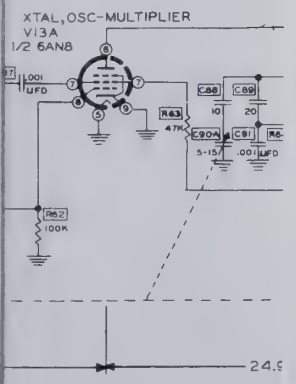


Pictorial 37

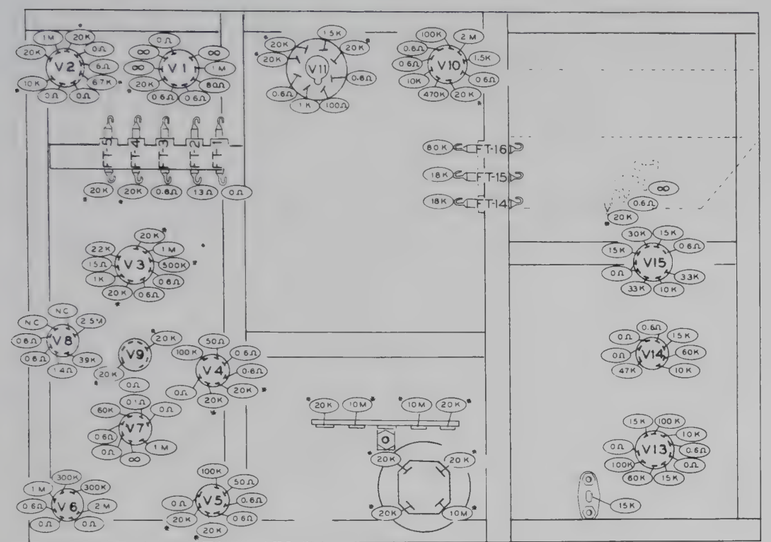

2 MC
AUDIO
IF AMP V4 6BJ6
IF AMP V5 6BJ6
DET 1ST AUD V6 6AQ6
IF-2
IF-3
IF-4
AUDIO GAIN
BFO V8 6AQ6
BFO PITCH CONTROL
BFO SWITCH
SPEECH AMP V10A 1/2 12AX7
AUDIO DRIVER V10-B 1/2 12AX7
MODULATOR/AUDIO AMP V11 6DZ7
MOD MONITOR SWITCH
EXT SPKR
PHONES
INT SPKR
PA SWITCH
SQUELCH V7 6BJ6
SQUELCH LEVEL CONTROL
AVC SWITCH
ANL P-P
DOUBLER V13B 1/2 6AN8
DRIVER V14 6AK6
FINAL RF AMP V15 6360
TO RECEIVER INPUT
KEY JACK
ANTENNA CONNECTION
24.9MC-27.0MC
49.8MC-54.0MC
49.8MC-54.0MC


2ND MIXER
V3-A
1/2 6EA8
R8
1MEG
R11
1K
C25
.02
MFD
TUNEABLE OSC
V3-B
1/2 6EA8
C24
.005 MFD
C121
50
C122
50
N750
R12
10K
C123
100
RFC-5
305 µH
RF GAIN
AVC BUS
REGULATED B+ 105VDC
RECEIVER B+ 125VDC


INPUT
SPEECH AMP
V10A
1/2 12AX7
RFC-13
11 µH
C61
100
R41
2.2 MEG
C120
10 µFD
10V
METER
1MA FS
BLK
RED


XTAL, OSC-MULTIPLIER
V13A
1/2 6AN8
.001
MFD
R83
47K
C88
10
C89
20
C90A
5-15
C91
.001 MFD
R82
100K

RESISTANCE CHART



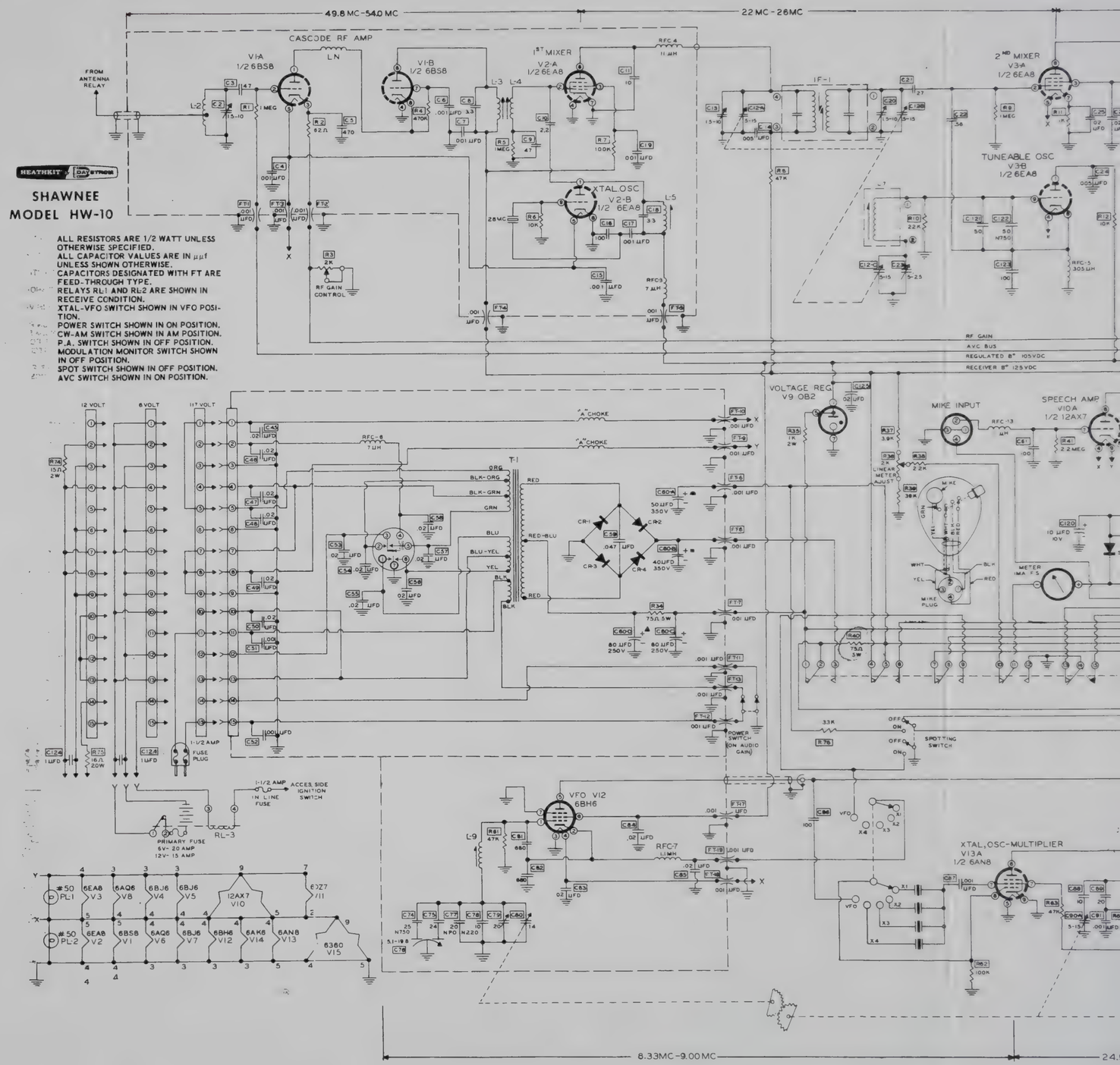
CONTROLS ARE SET AS FOLLOWS.

AVC : OFF
RF GAIN : FULL CW
BFO/PITCH : PUSHED IN AND FULL CCW
ANL. SQUELCH : PUSHED IN AND FULL CCW
FINAL TUNE : FULL CCW
SPOT : OFF
CW-AM AM
AUDIO : POWER OFF
X2-X3-X4-VFO : X4
RCVR TUNE : DIAL POINTER SET AT 50 MC
TRANS. TUNE : DIAL POINTER SET AT 50 MC
COUPLING : FULL CCW

LOADING : CAPACITOR PLATES FULL MESHED
MOD. LEVEL : PUSHED IN AND FULL CCW
MOD. MONITOR : OFF
POWER CORD DISCONNECTED

**IF READING IS ABNORMALLY LOW - REVERSE METER PROBES.

M = Meg
K - 1,000
* MINIMUM READING AFTER 5 SECONDS. WITH ALL TUBES IN SOCKETS.



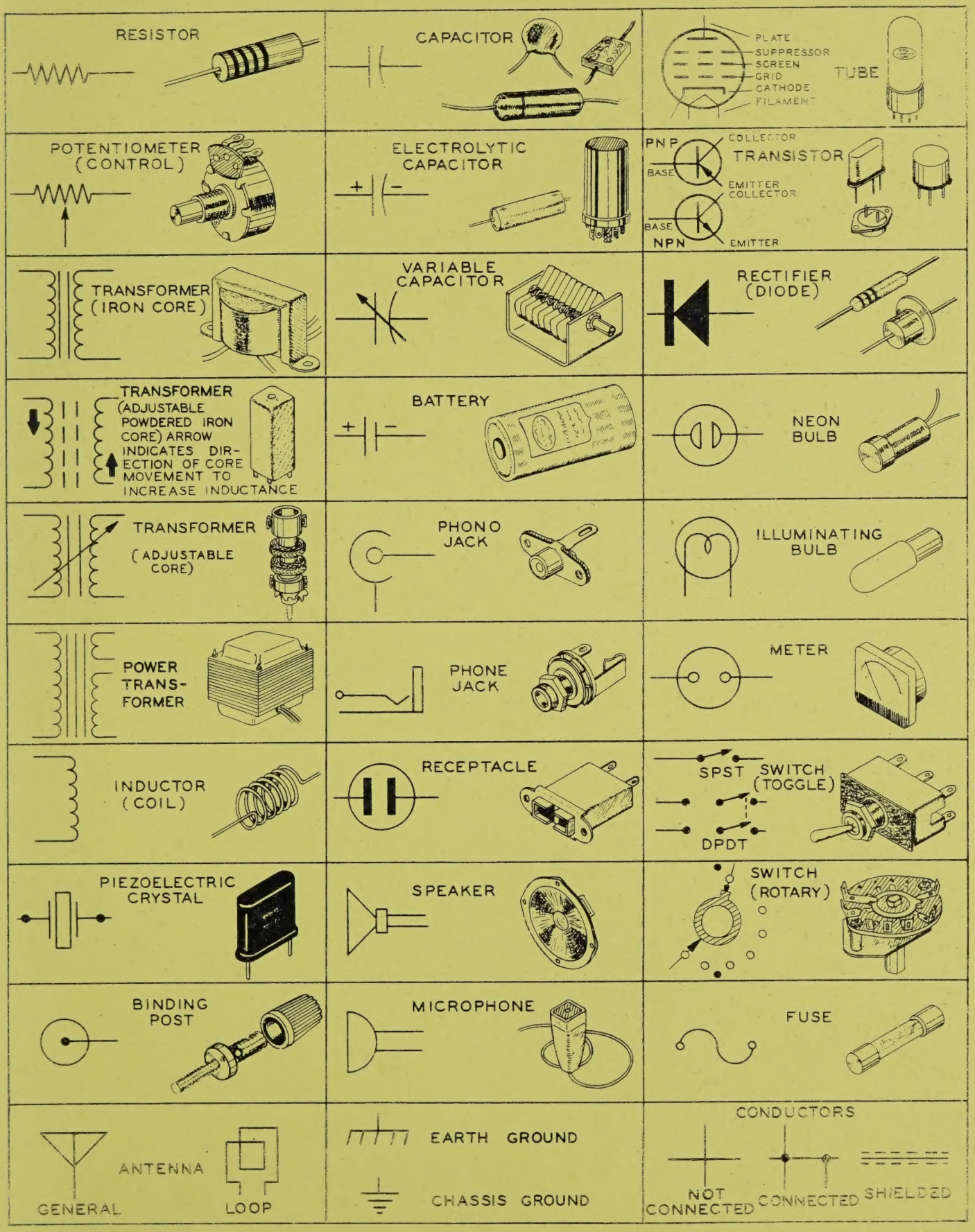
HEATHKIT / DAYSTROM

SHAWNEE
MODEL HW-10

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
ALL CAPACITOR VALUES ARE IN μμf UNLESS SHOWN OTHERWISE.
CAPACITORS DESIGNATED WITH FT ARE FEED-THROUGH TYPE.
RELAYS RL1 AND RL2 ARE SHOWN IN RECEIVE CONDITION.
XTAL-VFO SWITCH SHOWN IN VFO POSITION.
POWER SWITCH SHOWN IN ON POSITION.
CW-AM SWITCH SHOWN IN AM POSITION.
P.A. SWITCH SHOWN IN OFF POSITION.
MODULATION MONITOR SWITCH SHOWN IN OFF POSITION.
SPOT SWITCH SHOWN IN OFF POSITION.
AVC SWITCH SHOWN IN ON POSITION.

TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



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